SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1896, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXIV.—No. 25. ESTABLISHED 1845. NEW YORK, JUNE 20, 1896 [$3.00 A YEAR. WEEKLY.

MOSCOW AND THE CORONATION OF THE CZAR.

Palatial Petersburg and Holy Moscow are distant four hundred and three miles by rail, but the distance in time and civilization between the old capital and the new can only be reckoned by centuries. Moscow is a city of more than 750 000 inhabitants, yet it hardly deserves the name of city. It is in reality a colossal village, for it does not resemble even a European city of the third magnitude. Moscow consists largely of one or two story houses with court yards and outbuildings, each property being walled in, or at least provided with a hedge. There seems to be a lack of concentration to Moscow which interferes with the city having a monumental appearance. In the center stands the far-famed Kremlin, the shrine of Russian art and religion. With the Kremlin as a point of departure the city forms a succession of concentric zones. Moscow has a few streets that resemble those in St. Petersburg, which are adorned with fine buildings, statues, etc., as that of Nicholas I. This statue is situated between the Cathedral of St. Isaac and the Maria-Nicolaierna Palace. Nicholas I was the third son of the Emperor Paul. He succeeded his brother Alexander in 1825 and occupied the throne until 1855. The boulevards around Moscow are most imposing, and the parks and squares which are so abundant are in excess of the real demands. The reason of the isolation of the houses is the frequency and extent of the fires. From what has been said it will be seen that Moscow is not a monumental city, but at any rate it is a picturesque one with its three hundred and fifty churches with their bright blue and gilt spires and domes. This barbaric splendor of the decorations would soon become mean looking if, like the Hollanders, the Russians did not have a passion for paint and whitewash; and it is even stated on credible authority that the oldest churches in the Kremlin are entirely renovated every year or two. Moscow is not built on a level, and the elevation is changed so frequently that a large number of picturesque views can be obtained. The conveyances are numerous and are sometimes picturesque, sometimes prosaic, but they move at a brisk pace and help to give life and color to the scene.

The quaint and gorgeous Kremlin, standing on a hill in the center of this city of magnificent distances, is of uncertain foundation. In 1339 it was surrounded by oaken walls. It forms an inclosure nearly two miles around. Its walls are pierced with five gates; the principal being the Shaski Vorota, or Redeemer's Gate, having a highly venerated picture of the Saviour over it; all who enter by it are required to bare the head. Entering the square, the visitor sees three cathedrals and two other churches—one, St. Basil, having eleven polychromatic spires and cupolas; the great bell, the palace, etc. The great bell, which we illustrate, is one of the sights of Russia. The tower of Ivan Veliki is the campanile for the three cathedrals of the Kremlin. It contains thirty-four bells, the largest weighing 64 tons. The great bell at the foot of the tower is the Tzar Kolokol, which according to the inscription was cast in 1733. It never seems to have been actually hung or rung, having cracked in the furnace. It weighs about 440,000 pounds; its height is 19¼ feet; the circumference is 60 feet 9 inches. The thickness is about 2 feet. The weight of the broken piece is 11 tons. It is now used as a chapel. In the Cathedral of the Assumption, a small church founded in 1326 and rebuilt in 1475, the present Czar of Russia was crowned on May 26, with imposing ceremonies and fetes, the cost of which will exceed $20,000,000.

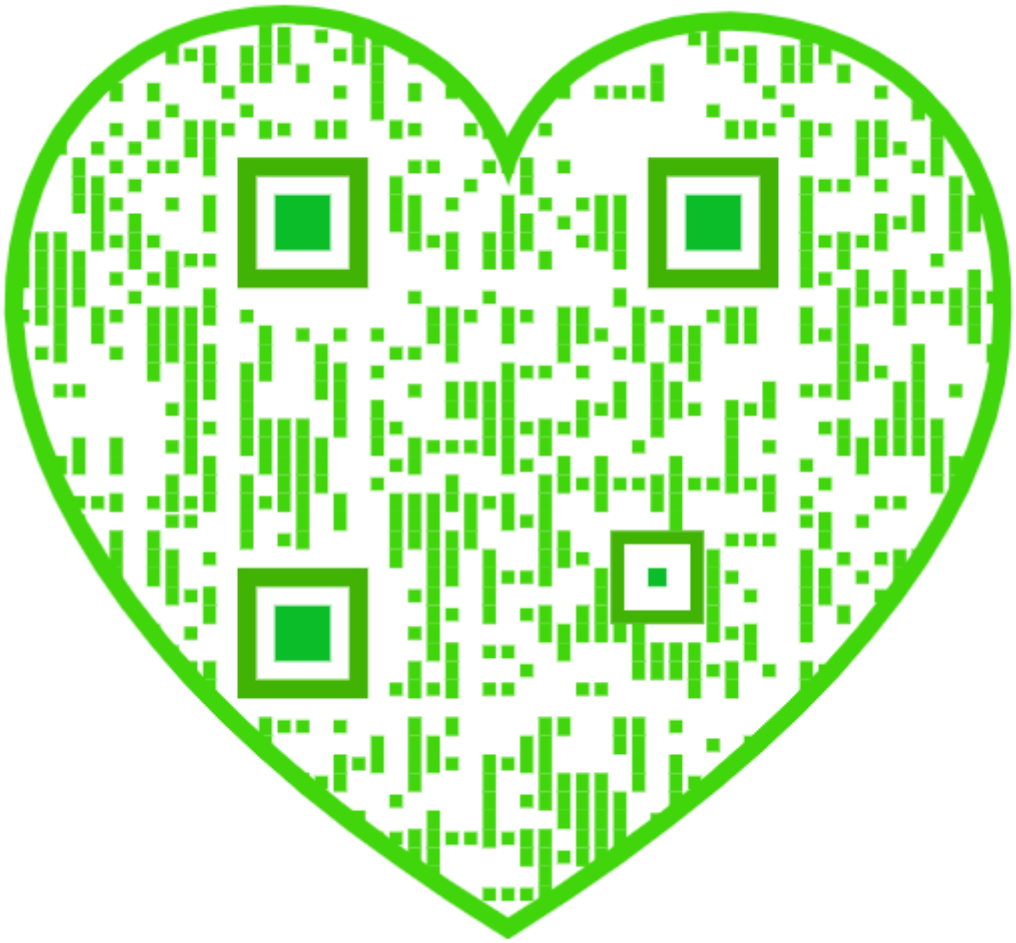
The Czar made his triumphal entry into Moscow on May 21, accompanied by the Empress and the Court. The route from the Petroffsky Palace to the Kremlin, a distance about three miles, was lined by an enormous crowd of spectators. The way was elaborately decorated by fluttering flags, banners, pennants and escutcheons. Streamers stretched across the roadway and garlands of heather hung from Venetian masts. Little sleep could be obtained in Moscow the previous night, on account of the large crowds of the lower orders, who were obliged to shift for themselves in regard to lodgings and places to view the pageant.

When the cannon announced that the cortege was getting ready, the church bells of the myriad-belled city began their chiming. Hats were removed and the sign of the cross was made by the devout Russians. His Majesty was followed by an immense retinue of officers of all nations in every variety of uniform. The Czar looked calm and serious and continually raised his hand to salute the acclaiming crowds. The progress was marked with a continual boom of cannon and a clanging of bells to the tune of the national hymn, joined to the cheering of the vast assembly. The Empress was seated in a magnificently gilded coach, drawn by eight beautiful cream colored horses, and in the following gilded coach, without a crown, sat the Empress Consort, graciously bowing acknowledgments. Both their Majesties were dressed in Russian costume, pure white with silver brocade. Their Imperial Majesties alighted at the Gate of the

(Continued on page 393.)

THE CORONATION OF THE CZAR—THE PROCESSION ENTERING THE HOLY GATE.

© 1896 SCIENTIFIC AMERICAN, INC.



Scientific American.

ESTABLISHED 1845.

MUNN & CO.. Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

One copy, one year. for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy.one year,toany foreign country belonging to Postal Union 4 00
Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.

(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders and all who contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico. $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American

(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies, 25 cents.

MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JUNE 20, 1896.

Contents.

(Illustrated articles are marked with an asterisk.)

Acetylene in use 389
Africa, our trade with 391
Bed and sofa combined* 390
Bicycle craze, ravages of the.... 391
Calorimeter, respiration 387
Clock making, American 387
Crookes tubes 394
Czar, coronation of the* 385
Dog iron worker 394
Electric lighting by artesian wells 392
Extrusion, metallic bars by* 389
Filing cabinet* 388
Foundations of heavy buildings. 392
Grafting of living tissues 388
Invention, patience and perseverance in* 386
Lake trade, improving 387
Lamp hanger, electric* 388
Legal machinery 386
Mending vulcanite dishes 386
Moscow 385
Ornithological 388
Polar region map 390
Prompt people 390
Roentgen rays foreshadowed 395
Saw mill* 388
Science notes 390
Skirt dance, the 392
Stereoscope, inverting* 395
Temperature, research, low 387
Trolley without poles 390
Ventilator, hydraulic 393
Viviscope, the* 395

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1068.

For the Week Ending June 20, 1896.

Price 10 cents. For sale by all newsdealers.

PAGE

I. BOTANY.—Stove Shrub—Posoqueria Macropus.—An interesting accession from Brazil.—1 illustration 17072

II. CHEMISTRY.—Test for Olive Oils and Seed Oils 17068

III. CIVIL ENGINEERING.—Coast and Lighthouse Illumination in France.—By C. S. DU RICHE PRELLER.—Continuation of this very important and valuable article treating of lighting buoys and lightships.—6 illustrations 17070
Note on Recent Operations on the Iron Gates of the Danube 17068

IV. EDUCATION.—The Making of a Great University for London.—By SILVANUS P. THOMPSON.—Conclusion of this far-sighted article and plea for the building up of a great world's university 17064

V. ENTOMOLOGY.—The Parasol Ant.—Note on a curious member of the ant tribe of insects 17078
Note on the Psychological Laboratory of California 17078

VI. FORESTRY.—Forest Resources of the United States Briefly Stated.—A very elaborate article, with tables of statistics of the forest industry of America and its relations to other industries... 17072

VII. GEOLOGY.—What is Bitumen?—By S. F. PECKHAM.—An elaborate examination of the nature of bitumen, with many interesting points in the history of petroleum 17071

VIII. MECHANICAL ENGINEERING.—Lathe for Turning Several Objects of the Same Shape.—An ingenious lathe carrying a number of centers and tool rests working from the same bed.—1 illustration 17067
Notes on Steam Superheating.—By Mr. WILLIAM H. PATCHELL.—First installment of an important illustrated paper on superheating steam.—13 illustrations 17066

IX. MEDICINE.—The Senses—Their Use and Cultivation.—Conclusion of this interesting paper, directed especially to young physicians 17063

X. METEOROLOGY.—Physical Phenomena of the High Regions of the Atmosphere.—Cyclonic and other phenomena of the atmosphere examined.—Experimental illustrations of the same.—8 illustrations 17076

XI. MISCELLANEOUS.—The Coronation of the Czar.—Notes on the recent festivities at Moscow.—View of the Czar passing through the holy gate into the Kremlin and of the coronation.—2 illustrations 17063
Selected Formulæ 17068
Engineering Notes 17069
Electrical Notes 17069
Miscellaneous Notes 17069

XII. ORDNANCE.—The Gold Cannon in the Royal Arsenal at Berlin.—A very beautiful accession to the Royal Arsenal at Berlin, an elaborately gilded cannon.—A unique relic.—3 illustrations 17071

XIII. PHYSICS.—Note on the Effect of Low Temperature upon the Colors of Chemicals 17072
On the Roentgen Rays Electrized.—By A. LAFAY.—A curious investigation into the nature of the electric rays.—Resume of recent experiments 17065

XIV. SANITARY ENGINEERING.—The Waring Plan for the Scientific Disposal of Street Sweepings and Garbage.—How it is proposed to keep New York clean.—The separation of house refuse into classes 17078

XV. TECHNOLOGY.—Engraved Half Tones.—By M. LAMONT BROWN.—Supplementary work upon half tone blocks.—The application of the wood engraver's technique to the copper half tone surface 17068

XVI. TRAVEL AND EXPLORATION.—The Army of the Congo Free States.—An interesting article on the native soldiers of South Africa.—Their habits and armament, with illustrations and map.—4 illustrations 17074

PATIENCE AND PERSEVERANCE IN INVENTION.

It is unfortunate that the person who claims, or is accorded by the public, the title of inventor should be popularly regarded as possessing powers which border on the miraculous; for, as a matter of fact, the most successful inventors have ever proved to be men of a practical turn of mind and of clear vision; who loved to pursue their investigation on logical lines, laying the foundation broad and firm as they proceeded; men who were marked above everything else by unwearying patience and a perseverance that was unconquerable. The inventor is possessed of no sixth sense, whereby he probes more deeply into the secrets of the sciences than others can go. If he turn up nuggets of priceless value, it is not by virtue of any divining rod which he carries, but because he digs deeper than other men to find them.

This is a truth which the average inventor too often fails to grasp; and if success does not attend his first or second attempt, he is liable to throw down his tools in disgust at the very time when a little more experimental work would have achieved the desired result.

The archives of the Patent Office can show thousands of cases where a discarded invention, which lacked but one feature to insure its success, has ultimately been taken in hand and perfected by a later inventor, who has had the patience to work out the necessary details. It is true there have been many notable cases in which he has stumbled upon his invention in the very first hours of his search; but they are rare. In the majority of cases the great inventions of any age, and particularly of this present age, have first presented themselves as a vague idea, embodied in forms more or less crude. It was only after this crude form had been laid on the anvil of the mind, and hammered and rehammered, day in, day out, and in some cases for years at a stretch, that the rough conception became the perfected mechanical shape, and brought fame and wealth to its author.

One of the great inventors of the age is Mr. Edison, who has been called in terms of well intentioned, but doubtful, compliment "The Wizard of Menlo Park." There is no spirit of necromancy to be found brooding among the vast collection of apparatus in Mr. Edison's laboratory. The whole place is devoted to invention as expressed in the good old Latin root meaning of the word: "to come upon," and hence to find. Invention, in the case of Mr. Edison, is a search; and the search is prosecuted along multitudinous lines with a perseverance which may have been equaled, but has never been surpassed in the history of the world. Speaking of himself and his work, Mr. Edison has said: "In my own case but few, and those the least important, of my inventions owed anything to accident. Most of them have been hammered out after long and patient labor, and are the result of countless experiments, all directed toward attaining some well-defined object. All mechanical improvements may safely be said to be inventions, and not discoveries."

It is not the man who dreams of better mechanical ways of doing work, but he who by intelligent experiment works out the mechanical forms that translate the dream into a reality, who is entitled to the name of inventor.

It is said that Elias Howe, as he lay one night watching the busy needle of his wife, dreamed of mechanical sewing. Doubtless other men had so dreamed before him. For a whole year he labored on a mechanical stitch; but when he tried the machine, it was a failure. Most inventors would have gone back to dreaming; but Howe threw aside his double pointed needle and continued inventing, or searching, until he found the fundamental idea in a combination of needle and separate shuttle, and gave to the world the sewing machine of to-day.

There is no invention in any age that has exercised so powerful an influence upon the destinies of the nations of the world as the steam engine, of which Watt may be truly said to have been the father; and yet it is a fact that a steam boiler, and an engine propelled by steam, were constructed by Heron, one hundred and twenty years before the Christian era. The apparatus was very crude and elementary; but the root idea was there. Had the ancient experimentalist persistently followed up the line of investigation which his curious experiments suggested, the history of mechanics might have been set forward 2,000 years.

Denis Papin, in 1688, with his piston inclosed in a cylinder, and Thomas Newcomen, of later date, with his condensing engine, were both standing on the very threshold of the greatest mechanical invention of the age; but it was only when Watt brought his powers of intelligent and patient search to bear upon Newcomen's crude mechanism that the steam engine of the nineteenth century was produced.

The bicycle, with its two wheels pivotally connected, up to a few years ago was restricted to the use of those who were acrobatically inclined. The introduction of the chain and rear driven wheel gave us the safety, and the popularity of the bicycle was thereby largely increased, although the most important feature of all was yet lacking. It was only when the pneumatic tire —an old idea—was perfected and applied to it that the bicycle became the most popular means of recreation in our day.

Stephenson's claim to be the inventor of the modern locomotive is based upon the fact that he was the first to combine the several features of horizontal cylinders, the vertical blast nozzle in the smokestack and a tubular boiler, and that by this combination he produced the type which is practically the same that we use to-day. Stephenson was not the author of the iron rail, nor of the idea of a steam driven vehicle running upon iron rails and carrying its own water and fuel. These leading features were present in the earlier engine of Trevithick. Had Trevithick labored to remedy the defects of his locomotive with the perseverance which was so strong a characteristic in his successor, it is likely that he, and not Stephenson, would have been named the father of the modern locomotive.

And so, throughout the whole field of invention, it will be found that the greatest achievements have been in the strictest sense inventions rather than discoveries; the work of practical mechanics who as often as not wrought out in concrete form the dreams of their fellowmen.

The obvious moral to be drawn from these reflections is that where the inventor has good reason to believe that the root idea of his invention is sound and useful, he should never become discouraged by failure in the minor details. Patience under the sting of failure and perseverance in new lines of search will often secure to the first inventor those fruits of his toil which are now too often gathered by other hands.

To Mend Cracked Vulcanite Dishes.

BY REV. T. PERKINS.

A mishap occurred to my only 12 by 10 developing dish a few days ago. A servant, in her misguided zeal for tidiness, finding the dish full of water on the table, and thinking it had better be put into its usual place set up against a wall, proceeded to lift it by one corner, with the result that a piece of the walls of the dish, including the angle, was completely broken out, so that the dish would no longer hold any liquid. Living as I do in a remote country village far from all dealers and unable to get another dish, I found this a serious matter, as I had just returned from a club "field day" with several 12 by 10 plates to develop. So I resolved to see if I could make good the damage. This I have done so that the plates have been successfully developed and are washing as I write. I first bored several small holes with a hot darning needle near the edges of the broken part, and also corresponding holes near the broken edges of the dish to which I wished to fasten it, so that I could rivet the broken part to the dish with rivets formed of wire similar to those used by the menders of broken china. Thus the broken piece was firmly held in place, but of course the dish leaked; so I melted some beeswax and resin in a spoon over a lamp, and when it had cooled a little poured it into the corner of the dish. At first it ran through the crack, but very soon set, completely filling it up and rendering the dish perfectly watertight. The developing solution has had no effect on this cement. Whether it will last long I cannot say. Anyhow, the repair was quickly effected, and should the dish leak after a time, I shall be able to melt the wax and fill up the cracks with it again.—The Photographic News.

Cumbrous Legal Machinery.

When a judge and jury have tried an offender and reached a verdict, the appellate court proceeds to try, not the prisoner for his guilt, but the trial judge for his procedure. Unless the latter can show that throughout the long and wearisome trial he made no mistakes, the case is sent back for new trial, by which time the witnesses have generally disappeared. The consequences of prolonged discussions and voluminous judicial essays on such details as the empaneling of a jury, the spelling of a juror's name, the initials of a witness, or the omission or misstatement of some legal fiction or antiquated phrase, tend not only to remove punishment far off from the criminal, but to depreciate the dignity and usefulness of courts. The decision of the court that tried the case comes to be of small consequence in public estimation, when it may be and often is reversed by some distant judge who never saw the jury or heard a witness. The court above, after many months of delay, often decides on minute points, sometimes of mere practice, which non-professional persons can scarcely regard except with hilarity. Hence frequency of appeal in criminal administration has a mischievous tendency to minimize the respect with which every community should regard its local court, and to impair the prudent reflection with which the people should select their judges. For what signify the qualities or capacity of a county judge, if he is to be a mere conduit through which all cases where the prisoner has any money must flow on to more distant courts for the only real and final decision?—I. J. Wistar, in June Lippincott's.

© 1896 SCIENTIFIC AMERICAN, INC.

The First Five-Day Experiment with a Respiration Calorimeter.*

The respiration calorimeter at Middletown, Conn., designed by Professors Atwater and Rosa, of Wesleyan University, has been in process of construction and development for the last three years. It has this winter been perfected so as to render accurate experiments with it possible. A Swede, janitor of the laboratory, has been used from time to time for trial experiments of a day or so; but when it became possible (and, in fact, almost necessary, to insure accuracy) to make runs of a longer period than two days the Swede objected, and volunteers on the force were called for to give apparatus a fair test experiment running over a period of from five to ten days. Mr. A. W. Smith and myself offered our services. It fell to me to make the initial trial, and the date of my entering the calorimeter was fixed for March 16.

The object of a respiration calorimeter in general is to offer a means of determining the respiratory products of the lungs and the heat given off by the body of the animal or man experimented upon. Pettenkofer, a German, was the first to try a respiration calorimeter. He experimented with animals. His analyses of respiratory products were more or less inaccurate, and, as far as measuring heat was concerned, only the grossest approximation was obtainable. The apparatus in Middletown is the first to render possible accurate determinations of respiratory products, carbonic acid gas and water, on a large scale, and to afford anything like accuracy in the measurements of radiant heat from human beings. The appliances for measuring the heat are electrical, and the greatest delicacy of registration has been attained. With this apparatus it is designed to determine the heat given off when a man rests, works mentally, and works physically. But all these things are only steps leading up to the great principle of the conservation of energy in the physiological world. This has long been assumed, but has never been definitely proved. In order, however, to accomplish anything definite in this line, the whole income and outgo of the body must be known. In other words, a digestion experiment must be made, together with a calorimetric experiment—that is, a given amount of food is given a man; this food has a definite heat value or a definite amount of potential energy. By taking account of the waste products and their heat values, and the heat radiated by the individual, we see whether this is equal to the heat value of the original food. This appears easy, but a good many factors hard to estimate come in—for example, the storing of food in the body as muscle, fat, etc.—which complicate the case very considerably.

Four days before I entered the calorimeter I began to live on a particular diet, which I kept up without change till I came out. The diet chosen and maintained from first to last was:

Breakfast--Apples, three ounces; two eggs, six ounces; potatoes, five ounces; bread, two and one-half ounces; butter, one-third of an ounce; coffee, two thirds of a pint; milk, one-fifth of a pint; and sugar, three-quarters of an ounce.

Dinner—Beefsteak, Hamburger style, made into thick balls and broiled, four and-one half ounces; potatoes, four and three-quarter ounces (plain mashed); bread, two and one-half ounces; butter, one-third of an ounce; tea or coffee, two-fifths of a quart; milk, two ounces; sugar, three-quarters of an ounce; and canned pears or peaches, five ounces.

Supper—Peaches, seven ounces; milk, one pint; sugar, one-third of an ounce (on the fruit); and bread, two and one-half ounces.

From this another interesting phase of the subject presents itself. Different diets can be administered from time to time, and different sorts of labor can be done by the person experimented upon, to see which is the most efficient and economical diet for a certain kind of work. The solving of this problem will inaugurate a new era in economic progress.

I entered the calorimeter about 10:30 A. M. March 16, through the open aperture, a window, and the glass of the window was puttied in tightly behind me. With me I took a cot bed, a chair, table, some cushions, rugs, and books. The only means of getting anything in to me was through a brass cylinder about eight inches in diameter. This was closed ordinarily at both ends. To pass anything in, the outer cap was removed, the material placed in the cylinder, and the cap replaced. I then removed the inner cap and took out whatever was there. Everything I ate had to come in this way.

From the one window I received plenty of light to read and work by. In the evening an electric light was hung directly against the window outside, which gave even better light than daylight. I busied myself reading, writing, and working on some calculations I had on hand. By keeping busy I didn't mind the confinement at all. For exercise I would walk about the box, which has about thirty square feet area, run back and forth, and go through various movements with my legs and arms. Sometimes mornings my head would feel rather dull, but it would always pass away after breakfast. A constant stream of air was supplied me, which was analyzed as it went in and came out. The air seemed to keep very good. The dullness in my head on arising I ascribed to the slight shaking of the calorimeter caused by a motor in the room. I slept well, my appetite kept up on my monotonous diet, and on coming out on March 21, I found I had gained two pounds.

The experiment was a success in showing that a person can remain in the calorimeter with perfect security, and, so long as he keeps busy contentedly, for a considerable period of time. Further results have not as yet been worked out, but everything seems to indicate that it was a success in every way.

* By Olin Freeman Tower, Ph.D., Middletown, Conn., Assistant Chemist, Agricultural Experiment Station, Wesleyan University.—From the Medical and Surgical Reporter.

Improving Lake Trade.

The Bessemer, the first of Rockefeller's line of twelve steamers and consorts, was launched at Cleveland recently, says the New York Press. She is 412 feet long and will carry 4,600 tons of freight on 15 feet draught. She was one of three steamers launched that day at lake shipyards, one slightly smaller and the other slightly larger than the Bessemer. The shipyards of the Great Lakes had ninety vessels of various classes and dimensions under construction when the season opened this spring. A fleet of this number a dozen years ago would have meant comparatively little, for the size would have averaged far less than this one does now, for only twenty-four are less than 100 feet long, and there are eight that will carry 5,000 tons each, and there are twenty others that will carry 4,000 tons or more, all on a draught of 15 feet. Nearly fifty of the new boats are to be of steel, which is now supplanting wood for all vessels of large size, in spite of the extreme liability of all metal bolts to receive serious injury from contact with rock, which abounds in the passages between the lakes. Fortunes are lost every season by raking the bottoms of the big carriers on the rocks, but the ease of repairing them and rendering them as good as new holds the steel construction in favor. This new fleet will cost when finished a trifle less than $10,000,000, and it will have a carrying capacity of close to 200,000 tons at a single load. As two weeks is rather more than the average time for a vessel to make a round trip on the lakes, unless it tows as well as carries, the amount of freight that the new fleet will move in the season of eight months is seen to be enormous; when it is added to the already great fleet in operation, some vessels of which are carrying more than 5000 tons of freight at a load, the size of the lake trade may be imagined. Now as to ocean shipbuilding at home. There are under construction on our seaboard, east and west, seventy-one vessels, most of them steel steamers, but many of them of moderate size. Only one, the cruiser Brooklyn, is 400 feet long. This is her exact length, while of the lake list there are thirteen that are 404 feet long or more. The total length of the new ocean fleet is 12,500 feet instead of the 20,000 feet of the unfinished lake fleet. Business on the lakes is much better than was indicated when boats began to move a month ago. Most rates of freight are firmer and some are higher.

Low Temperature Research.

At the Royal Institution, London, Prof. Dewar, F.R.S., recently made some interesting remarks upon the apparatus to be employed and the difficulties to be overcome in approaching the zero of absolute temperature. Below —210°, he said, to obtain a single degree of greater cold involved a positive struggle with nature. The present aim of low temperature research was to get below the critical point of hydrogen, and the only means by which this was possible was by the adiabatic expansion of hydrogen itself. The principle discovered by Thomson and Joule, that cold was produced if gas at high pressure was allowed to escape from a very minute orifice, had been utilized with success. Thus, if a jet of air at high pressure issuing from an orifice one-quarter inch to one-tenth inch in diameter were made to impinge on the outside of a tube containing air, so much cold was produced that the air in the inside tube would condense on the sides in a liquid form, provided, of course, the whole apparatus were efficiently isolated with regard to heat. In a similar manner, a hydrogen jet could be used, as was experimentally shown, to produce a temperature low enough to freeze air to a hard, white solid. A hydrogen jet at ordinary temperatures, however, would give no reduction of temperature; that would only be obtained if the gas were initially cooled to a temperature much nearer its critical point. The efficiency of such a process was by the nature of the case very small, and the fact that the expansion of hydrogen at a pressure of 500 atmospheres and a temperature of —200° would only produce about 7° of greater cold than would be won by its expansion at the same temperature from a pressure of 100 atmospheres, showed the difficulties encountered in attempting to reach temperatures sufficient to liquefy hydrogen. Even suppose the liquefaction accomplished, the difficulty of collection was very great, for the density of liquid hydrogen at the boiling point could not be above one-tenth that of water. But, in spite of these obstacles, says the Colliery Guardian, Prof. Dewar believed that some day some one would succeed in collecting it and carrying out investigations upon its properties.

American Clock Making.

More than a hundred and twenty years since, Isaac Doolittle, an original warden (1770, April 16) of Trinity Church, in New Haven, and the most important man among its founders, was a brass founder and maker of the old time brass wheel clocks. He was a citizen of character and enterprise, whose mark in his generation was that of striking originality. Not only did he supply clocks in the colony, but in 1774 he advertised that he had built a bell foundry and equipped it for the casting of bells. In the war of the revolution he joined Jeremiah Atwater and Elijah Thompson in making gunpowder at Westville, near New Haven, so much to the discontent of the Trinity Church Tories that from 1778 to 1783 they dropped him from the office of warden.

The more extensive modern making of clocks, after new patterns and in considerable number, began with Eli Terry, nearly a hundred years since, and somewhat later, with Chauncey Jerome and his nephew, Hiram Camp. Terry, the father of wood clock making by machinery—i. e., wheels of wood to save the expense of brass—was born at East Windsor, Conn., 1772, April, and in 1793 began, in a small way, clock making at Plymouth, Conn. In 1807 he bought an old mill and fitted it up to make clocks by machinery. The next year he began five hundred clocks at once, a thing never before ventured. In 1810 he sold his works to Seth Thomas and Silas Hoadley, and Thomas developed upon this foundation a very large business. Terry invented, 1814, a style of clock called the pillar scroll top case, and, selling a right to Thomas for $1,000, they each made about 6,000 a year, at $15 apiece, and later 10,000 to 12,000 a year—each clearing by 1825 about $100,000 from the manufacture.

Chauncey Jerome, under whom clock making was to become a world-wide interest, worked for Terry in the winter of 1816, and the next spring, when his job was finished, began for himself, and effected that year his first great sale—twelve wood clocks for $144 in cash. In the winter and spring of 1821-22 he secured a shop, in Bristol, Conn., and in the fall of 1824 formed a company, which, in 1825, built a small factory. The same year Jerome's device of what he called the bronze looking glass clock made an epoch in the trade, many pushing into the business, and large profits resulting, from 1827 to 1837; after which the next great development was his device of a one day clock—i. e., a simple clock with wheels of brass instead of wood—the idea of which he worked out early in 1838. The zinc dial instead of wood was first introduced with this precursor of all cheap clocks. After reaching, 1841, success represented by $35,000 profits in one year, Jerome started an English agency in London, 1842, against prejudice which at first absolutely barred making any sales at all, until a merchant was induced to permit two clocks to be left with him, and, finding that they sold at once, allowed four more to take their chance, and then twelve more, thus initiating a trade which, in ten years, reached $150,000 a year, a profit of $20,000. As soon as the English business was under way, the revenue officials, in view of the low price at which the clocks were invoiced, took a couple of cargoes, at the ten per cent advance which they had the option of giving, to take whatever came in, but did not meddle further with the American clock invasion.

In 1843 Jerome's works at Bristol grew to extensive proportions by the addition of two large factories, fitted with machinery and tools for making brass movements; and the next year, 1844, he started a factory in New Haven, for making cases and boxing the finished clocks. A year later, 1845, April 23, a great fire destroyed the Bristol works, including seven or eight buildings, extensive and costly machinery, and from 50,000 to 75,000 brass movements. This caused the transfer at once of the whole business to New Haven, where the brass movements making was under way again by the middle of June. Rapid making by the best machinery was now reaching a marvelous perfection; competition was very keen; and some makers were flooding the market with poor clocks. Jerome's final device in clock making was a "timepiece" sold for a dollar or less—a time clock but not a striking clock. In 1850 Jerome united with the Benedict & Burnham Company, of Waterbury, Conn., to form the Jerome Manufacturing Company, each putting in $35,000. After a year or two of large and profitable business Jerome bought out the other stockholders, his son mainly managing the business from this time, and new parties coming in, with an increase of capital to $200,000. But the ensuing period proved one of disaster, in which internal management and financial relations with P. T. Barnum played a part. Six months after the connection with Barnum, 1855, the company failed, and its founder was hopelessly ruined.—Boston Journal of Commerce.

© 1896 SCIENTIFIC AMERICAN, INC.

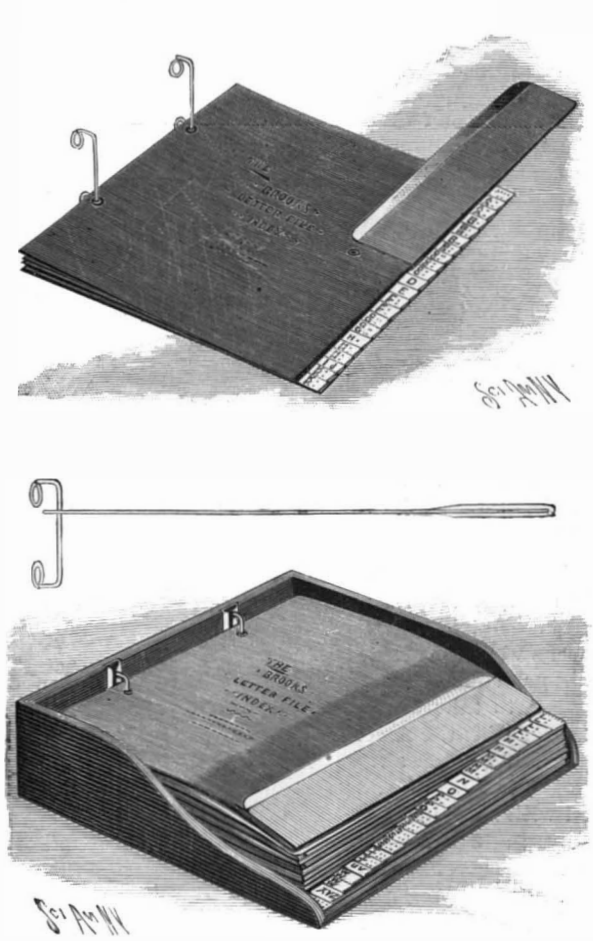
NEW DEPARTURE IN LETTER FILING CABINETS.

During the last ten years many improvements have been made and patents issued for all kinds of office devices, notably paper filing devices. However, loose sheet letter file improvements have been confined to some new kind of spring or cam fastening compressor, or some more or less complicated index fastening. A patent just allowed Mr. George H. Richter, of Boston, bids fair to make a decided innovation in this line.

The invention consists first in substituting for a spring a removable weight which is attached to the front edge of the cover of the index. This weight is made of spring brass, and slips over the front edge of the index cover (see Fig. 1). The under part of the weight is doubled upon itself and has a hole through the double thickness. The index cover has an eyelet which is raised on the under side and when the weight is drawn on engages the hole referred to, locking it positively to the cover. When the file is filled with papers and the index is to be transferred with the papers to the transfer case, the weight is drawn off in an instant by springing the lips apart sufficiently to clear the raised eyelet, and is placed on the new index. The weight is a permanent thing that cannot wear out.

Another part of the invention is a very simple device, but a very great improvement of an index fastening. It consists of a continuous piece of heavy wire which forms the pins for the sheets to slide upon, and the loops on either end slip into metal slides set flush into the drawer front. This fastening is so smooth that in shipping or handling it cannot possibly injure the index and cannot be bent out of shape, neither can it pull apart.

The advantages of this file are, first, it clears the drawer entirely of all the obstructions necessitated by a spring and its fixtures. It saves time in referring to letters, as the weight is raised with the index cover and so saves the two motions of first raising and afterward closing a spring when referring to or filing papers. This saving can hardly be overestimated. The weight is at the outer edge of the



LETTER FILING CABINET.

cover and so keeps the papers free from dust instead of opening them to the dust, as is done by all spring files, more or less, because they strike papers far back from the front edge. In referring to papers, the weight being very stiff and the full length of index, and being lifted with the index sheets, prevents the falling out of papers. The index wires being formed of one continuous piece allow the cover to tilt back over the front of file entirely out of the way, while springs when used stand perpendicular over the file, overhang the top, or catch the fingers if falling close to the drawer top. It will also be seen that there is nothing to get out of order, to mutilate the papers and make a disagreeable noise.

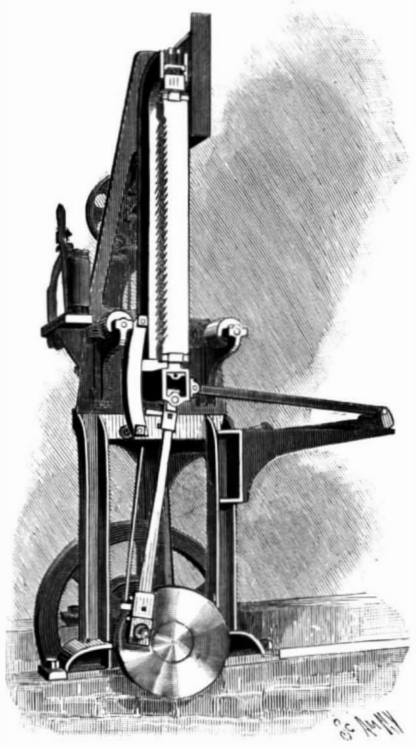
The index cover is doubled over at back edge, which makes it very stiff and strong, and the two pins used prevent the cover or index sheets from getting above the drawer front.

The transfer case, as will be seen, has two metal slides set flush into the wood, as in the file drawer, to receive the index wire loops, so that reference in the case is as convenient as in the file.

These cabinets can be had from the Office and Library Company, 102 and 104 Fulton Street, New York City.

AN IMPROVED SAW MILL.

A saw mill which is designed to economize time and power and save waste of material has been designed and patented by Mr. William H. Inglish, of East Tawas, Michigan. By reference to the engraving it will



INGLISH'S IMPROVED SAW MILL.

be seen to consist of a strong U shaped frame, at the bottom of which is the main drive shaft of the machine which carries a balance wheel, a large and small pulley and two crank disks. To the front disk is attached a pitman which is pivotally attached to the bottom shank of a vertical U shaped sash, which moves in suitable guides and in which are adjustably held the two vertical reciprocating saws, vertical motion being given to the same through said pitman by the revolution of the drive shaft. The desired lateral vibratory movement of the saws is obtained by means of a pitman which extends laterally from the side of the bottom shank of the sash, and engages with a rock shaft, which is operated through a horizontal arm and a pitman by a disk crank keyed upon the main drive shaft at the rear of machine. The amount of said lateral vibration or oscillation is determined by an adjustable connection between the rear arm of the rock shaft and the rear pitman. The proper tension in the saw blades is obtained by means of strong spiral springs which are arranged around the buckles which carry the upper ends of the blades at the top shank of the before mentioned sash. By an ingenious arrangement of bevel gears attached to the buckles which carry the inner saw blade, meshing with similar gears upon a vertical slotted shaft, and a system of friction pulleys operated by a belt driven from the main shaft, the distance between the two saw blades may be varied at will while the mill is running. The invention is adapted for use with a carriage and mechanism of any suitable form, and adjustable rollers are provided as shown in the engraving, to guide the log in its passage through the mill. The inside saw is set in the gate about one inch ahead of the outer saw, so that the outside board is cut off first, an arrangement which enables the lumber to get away freely from the saws.

The Grafting of Living Tissues.

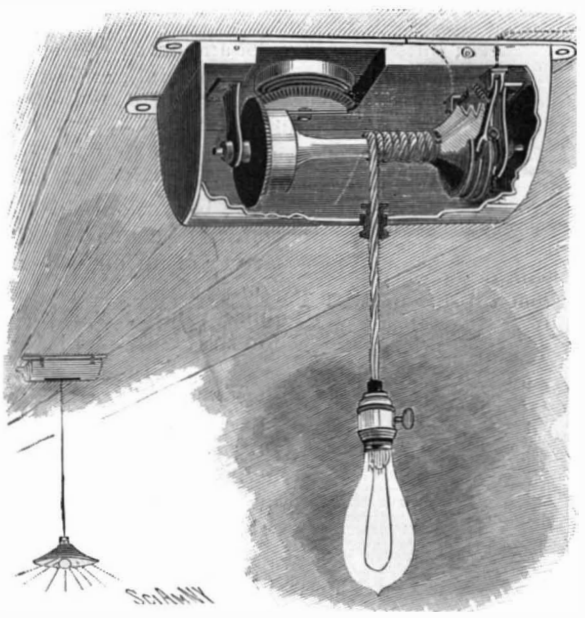
The German biologist Dr. Born has been grafting portions of one tadpole on another. The subject has been treated facetiously by the lay press and at last a novel has been based upon it. The editors of Natural Science, of London, make the following statement concerning it:

"The original experiments of Hunter, in which he transplanted structures from one animal to another, probably led to the modern attempts at bone and skin grafting. A few years ago, surgeons were confident that grafts of bone from rabbits and calves might be transferred to human bodies, while it was a current belief that skin might easily be grafted, or blood transfused. Mr. H. G. Wells, whose scientific novels have been a feature of the last two years, has based the plot of his recent 'Island of Dr. Moreau' on the artificial production of semi-human beings from animals. Dr. Moreau is a ferocious vivisector, with something of the hypnotist thrown in, and, by carving living animals (without anæsthetics) for many consecutive weeks, he has produced, and turned loose on his island, a set of amusing creatures, such as wolf-hyena-men, ox-hog-men, goat-vixen-ladies, and a puma-dog-lady who escaped in an incomplete condition, to the subsequent destruction of her artificer. The story is grewsome and exciting to a high degree"; but we have no doubt that our readers, who have missed great delights if they have not read the earlier scientific novels and stories of Mr. Wells, will form their own opinion of the qualities of the 'Island of Dr. Moreau.' From the scientific side, however, Mr. Wells seems to us to have allowed his imagination too free a run in his new story. . .

"Recent work on transplantation and transfusion [is] conclusively against the success of operations conducted upon animals of different species. Transplantations from one species to another almost invariably have proved unsuccessful. Most often the transplanted pieces become centers of suppuration; in the most favorable cases, they serve as inert centers around which new growth takes place. Histological examination shows that they die. So extreme is the aversion of a body to extrinsic material, that transplantations from other individuals, even of the same species, rarely hold. They are treated as foreign bodies. The successes are almost entirely confined to plastic operations, in which material from one part of a body is adapted to another part of the same body."

AN ELECTRIC LAMP HANGER.

A convenient device for regulating the height at which an incandescent lamp is suspended is shown in the accompanying illustration. It has been patented by Mr. Joseph Schmidt, of 257 East Seventy-eighth Street, New York City. It consists of a base block of insulating material, provided with a removable cover, beneath which block is arranged a winding spindle, upon which the suspending circuit wires are wound, and from which the lamp depends. The spindle, which is made of insulating material, is provided with two V shaped grooves in which are seated metal contact bands, which are engaged by two brushes, in the form of rollers, held against them by coil springs. The brushes are pivotally connected with plates, with which the line wires connect. The lamp wires pass through the body of the spindle and connect with the above mentioned contact bands. The end of the spindle is provided with gravity dogs, which engage notches formed on a collar of the fixed rod upon which said spindle revolves. On the opposite end of the spindle is mounted a bevel gear, which meshes with a horizontal bevel gear, mounted in a recess formed in the base block, the said gear wheel being provided with a coil spring. The lamp wires pass down through a tubular carrier which slides in a horizontal slot formed in the bottom of the cover. In operation, when the lamp is pulled down, the rotation of the spindle winds up the spring, the dogs holding it in any desired posi-



SCHMIDT'S ELECTRIC LAMP HANGER.

tion. To raise the lamp, it is pulled slightly downward, thereby releasing the dog from the notch, when the spring will rotate the spindle and wind the wires thereon, the action being similar to that of a spring roller shade.

AT the annual meeting of the British Ornithological Union, a proposal is to be discussed for a classification of birds, in a handbook divided according to the six great geographical parts of the world. Each division would form a volume containing 2,000 species, with a Latin diagnosis and a few selected synonyms. The proposal is made by Mr. P. L. Sclater, the secretary of the Zoological Society of London. The scheme has been on the whole approved, but it will have to undergo much discussion, and some species will be difficult to classify in the way of geographical distribution. The common crow, for instance, is popularly supposed to be found in all climates and all corners of the world.

© 1896 SCIENTIFIC AMERICAN, INC.

THE PRODUCTION OF METALLIC BARS OF ANY SECTION BY EXTRUSION AT HIGH TEMPERATURES.*

The author in his opening remarks drew attention to the fact that so rapid are the strides sometimes made by invention that it frequently overtakes the means at disposal for giving practicable form to otherwise practical ideas. A case in point is afforded by the invention of Mr. Alexander Dick, which deals with all kinds of metallic sections, by forcing metal heated to plasticity through a die under hydraulic pressure. The principle is the same as that employed in the manufacture of bricks, drain pipes, and similar articles.

It is true the principle of extrusion has been applied to the production of continuous lengths of leaden pipe and wire, and of leaden rods for the manufacture of small arm projectiles; but in the present case the metal is operated upon at a very high temperature, that of plasticity, or about 1,000° F.

The process of manufacture consists in placing the heated metal in a cylindrical chamber, at one end of which is a die. Upon pressure being applied at the opposite end, the plastic metal is forced through the die, issuing therefrom as rods or bars of the required section and of a length governed by the quantity of metal placed in the receiver. This pressure chamber has not only to withstand the high temperature of the contained metal, but has likewise, while under the influence of that temperature, to meet the severe strain brought upon the interior by the resistance of the metal to the pressure of the hydraulic ram in forcing it out through the contracted area of the die. Hence the first and most important point to be settled was the design of the cylinder and the material of which it should be constructed.

Several cylinders were made, some of cast and some of wrought steel, the chamber being 24 inches long and 6 inches internal diameter, and the walls from 3 to 6 inches thick. The cylinder was surrounded by an annular chamber, which was heated by a coke fire, the object being to maintain the plasticity of the metal during the operation of pressing. The cylinders, however, cracked badly as the result of expansion and contraction strains, and for a long time the progress of a promising invention was retarded.

The difficulty respecting the pressure chamber, or container, was eventually overcome by dividing up the container into sections composed of concentric steel tubes alternating with annular spaces packed with a dense non-conducting material. This arrangement is based upon the principle that steel, if heated only to moderate temperatures, will retain its full power to resist pressure; so that a cylindrical chamber formed of several conparatively thin walls, and protected from extreme heat, will resist pressure better than a chamber having a thick solid wall heated to a higher temperature.

By this compound system of construction, the liner, which is exposed to the extreme heat of the metal, may be made with a comparatively thin wall, and will not be liable to be fractured by unequal heating and cooling, and consequent expansion and contraction. Further, in order that it may be capable of successfully resisting pressure, it is re-enforced by means of the surrounding steel tubes, which, although of themselves thin, are insulated and supported by a dense packing of non-conducting material, and are therefore kept at a comparatively low temperature and in a condition to offer the greatest resistance, which condition is further mechanically influenced by a stout steel outer casing.

Another problem which took some time to solve was the selection of an efficient non-conducting material. After experimenting with a variety of substances, Mr. Dick found that the best results were obtained from crushed granite mixed with a small proportion of borax. This compound satisfactorily fulfilled all the necessary conditions, and was therefore adopted as a non-conductor.

The apparatus consists mainly of the compressing cylinder or container and the hydraulic ram. A longitudinal section of the container is shown at Fig. 1, a transverse section at Fig. 2, and an end view at Fig. 3. The container, which is 2 feet long and 2 feet diameter externally, has an inner liner of cast steel. The internal diameter of the liner varies in different containers from 5 inches to 8 inches, according to whether it is wanted for pressing a small or a large charge, the container being changed as required. The liner is inclosed within a series of cylinders of ordinary mild steel spaced about ¾ inch apart, the annular spaces being filled in with the non-conducting material. The container is mounted on trunnions and fitted with worm gearing for

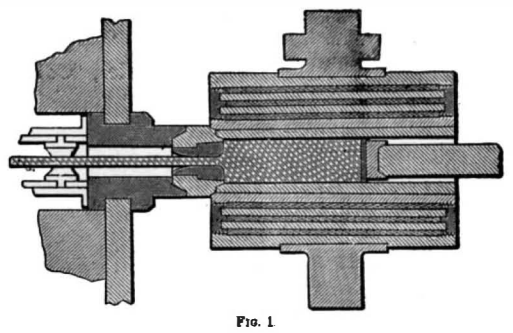


Fig. 1

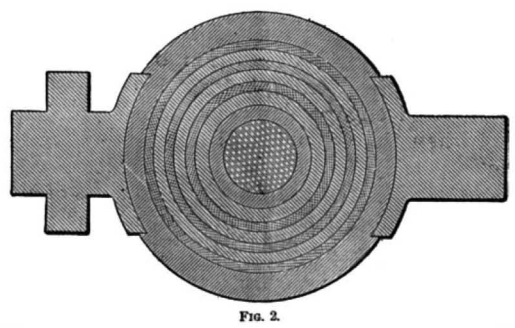


Fig. 2.

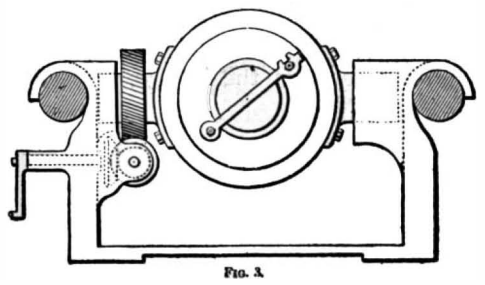


Fig. 3.

PRODUCING METALLIC BARS BY EXTRUSION.

bringing it to a vertical position for being charged with metal and restoring it to the horizontal for the operation of pressing, as shown in Fig. 3.

Great care has to be exercised in making the die plates, the material of which is tungsten steel. They are formed with either one or several openings, each opening being of the section required to be given to the article to be produced. The edges of the openings in the dies are beveled, so as to give free access to the metal under pressure and to more perfectly condense it. The metal is forced out of the container through the die by an 18 inch hydraulic ram, working under a pressure of 4,480 pounds per square inch.

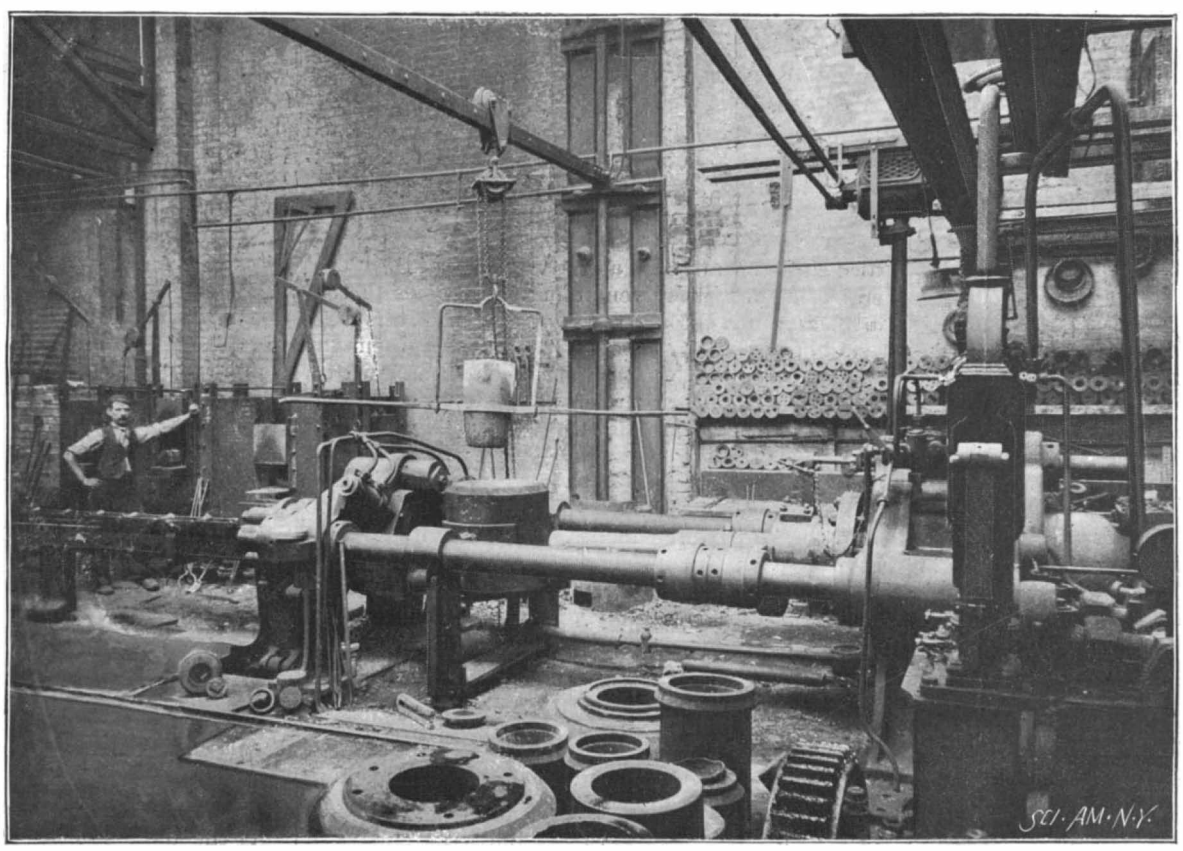
Upon the occasion of a visit of the author to the Delta Metal Works, New Cross, London, where this machine is in operation, it was producing Delta metal rods 1 inch in diameter and 12 feet long. The die used for them had four openings, thus producing four lengths, or an aggregate of 48 feet of rod at the same time. The container was turned into a vertical position and 168 pounds of molten metal was poured into it. It was then allowed to stand for six minutes so as to acquire a plastic condition. In order to prevent a back flow of the plastic metal taking place, a dished steel check disk, which is less plastic and more rigid than the heated metal at the working temperature, is first placed on the top of the charge, and when the pressure is brought on, the disk is expanded and completely fills the bore of the liner, thus effectually preventing the back flow of the metal.

Upon this check disk was then placed the loose steel block just referred to, which, having been previously heated, prevents the cold end of the plunger chilling the charge of metal. The plunger being of smaller diameter than the liner, there is no fear of the latter becoming chilled by the former. To preclude the possibility of such an occurrence, the back of the loose block is recessed to receive a corresponding projection on the front end of the plunger, which is thus kept horizontal in its forward travel and prevented from coming in contact with the liner.

The loose block having been inserted, the container was brought into a horizontal position, the stop plate removed, and the container run up to the die block, which, with the die, had been previously heated. The hydraulic pumps were then started, and in four minutes the charge was expelled and had become converted into four 1 inch rods, each measuring over 12 feet in length. The clips were then released and the ram continued its forward travel, pushing out the remaining metal, or stump, together with the die and its holder, as well as the check disk and the loose block, leaving the container perfectly clear for a fresh charge.

With regard to the physical characteristics of the bars thus produced, it is obvious that, owing to the great pressure put upon the metal, its quality must necessarily be greatly improved, in the same way that Whitworth steel is improved by compression. In the first place, it is found to be perfectly homogeneous. The actual increase of strength in extruded bars over that of hot rolled bars of the same metal varies with the nature and composition of the metal or alloy. Taking ordinary yellow metal, the increase in tensile strength is 24 per cent, with a proportionate increase in elongation. Some tests made at Woolwich Arsenal with Delta metal bars produced by extrusion show a tensile strength of 107.520 pounds per square inch, with 32·5 per cent elongation on 2 inches, against 85,120 pounds per square inch tensile strength and 20 per cent elongation of rolled bars of the same metal. The samples shown by the author of the paper were of a perfectly smooth surface, and they ranged from light sections, such as wire weighing about $\frac{1}{100}$ of a pound per foot, to heavy rounds, hexagons and squares weighing forty pounds and more per foot.

It will thus be seen that we have, if not a new industry, at any rate a new industrial process of far-reaching importance. It is not outside the bounds of possibility that, given an improved description of steel or other metal for the dies, other metals, such as iron and steel, which are less ductile and less expensive than those to which the system is at present applicable, may be used for the production of a still wider range of articles by extrusion.



PRODUCING METALLIC BARS BY EXTRUSION.

* Abstract of paper read before the Iron and Steel Institute of Great Britain at the Spring meeting, May, 1896. By Perry F. Nursey.

Acetylene in Use.

It is stated that acetylene is being tried in some of the tram cars in Paris, and with promising success. The generator, containing the calcium carbide and water, weighs under thirty pounds, and is placed beneath the steps of the vehicle, and it contains sufficient material for generating thirty-five feet of gas. As the lighting power of acetylene gas is something like fifteen times that of coal gas, the cost is stated to be less than that of illuminating the cars by petroleum. Doubtless, after this, we shall have a practical and safe application of acetylene for lantern purposes next season.—The British Journal of Photography.

AS the exact year of Gutenberg's birth is not definitely known, the year 1900 has been selected by the authorities of Mayence to celebrate his five hundredth birthday.

© 1896 SCIENTIFIC AMERICAN, INC.

Science Notes.

The fourth Congress of Criminal Anthropology is to be held at Geneva, Switzerland, under the auspices of the Swiss government, from August 4 to 29 of the present year.

An International Exhibition will be held at Brisbane, Queensland, Australia, during June, July and August, 1897. Special attention will be given to labor saving appliances of all kinds.

The instruments used in the observation of the British Association's committee on earth tremors are so delicate that an angle can be detected which corresponds with that subtended by a chord an inch long of a circle 1,000 miles in radius.

It is recorded that a fully equipped expedition will shortly start for the exploration of the remaining two-thirds of the interior of Australia which the Elder expedition left unfinished. Mr. Albert E. Calvert provided the funds for the expedition.

An aluminum quadrant has been devised to measure the actinic power of the Roentgen rays. The aluminum is arranged in concentric layers varying from one to ten millimeters in thickness. Measurements are made by holding the quadrant between the excited Crookes tubes and a phosphorescent screen or a sensitized plate.

Arrangements are now being perfected in Limoges to celebrate this year the centenary of the introduction of porcelain into France, by means of a retrospective exposition in which the history of porcelain manufacture will be traced. The exposition is being organized by the Société Gay-Lussac, working in conjunction with representatives of the town of Limoges.

A seismological department has been established at the Athens Observatory. It has been placed under the direction of Dr. Papavasilon, who is well known for his investigation regarding the Locris earthquake in 1894. Earthquakes are very frequent in Greece; 34 were recorded in January alone. A monthly bulletin will be published and regular observations will be made over the disturbed area.

Mr. E. D. Fridlander, B.Sc., recently gave an account of some observations of the amount of dust in the atmosphere made at various places during a voyage round the world in 1894-95. The experiments, which were made with a form of Aitken's pocket dust counter, showed that there are often considerable variations in the number of dust particles in a very short space of time. Dust was found up to an altitude of 6,000 feet or 7,000 feet among the Alps, and also in the open ocean so far away from any land as to preclude the possibility of artificial pollution.

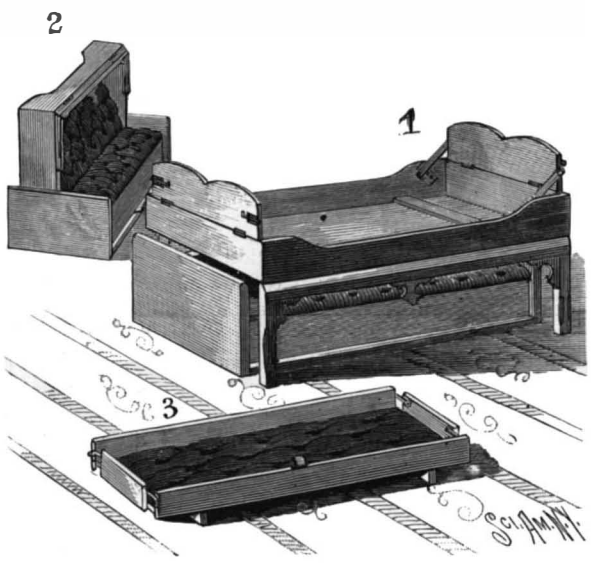
Columbia University will send a party of naturalists under the leadership of Prof. Bashford Dean, to explore Puget Sound. Three zoologists and one botanist will accompany the party. The deep sea work will be done with the Albatross. The region is almost unexplored. The region around Puget Sound is exceedingly rich and promising in its marine and botanical life. The expedition hopes to make extensive additions to the teachers' collections of the university, to add new types to the herbarium and zoological museum, and to collect unique material for research for staff and graduate students and for training in independent marine research. The party will return about the first of September.

In a paper published in the Astronomische Nachrichten Dr. See shows how, by a very ready method, determination may be made of the absolute dimensions of the orbits of bright and rapidly revolving binary stars by single spectroscopic measures of the motions in the line of sight of the component stars, and from the dimensions and other known data of the orbits the actual masses of the stars and their distances from the earth can be easily calculated. But perhaps the most important result claimed for this method is the means it furnishes of testing the question whether the Newtonian law of gravitation applies to stellar systems as well as to the solar system. Dr. See shows the manner in which may be calculated the motion in the line of sight in all parts of the binary orbit, these calculations being based upon the law of gravitation and a single spectroscopic measure. If such measures be continued upon a number of pairs, while the stars complete their revolutions, and the computed and observed motions in the line of sight agree throughout, within reasonable limits of error, it will be strong proof of the universality of the Newtonian law.

One of the most interesting exhibits at the Royal Society's recent conversazione was the series of photographic spectra of the Bessemer flame, as seen at the Northeastern Steel Company's works at Middlesbrough, shown by Prof. Hartley. The photographs demonstrated the presence of gallium, and subsequently this body was separated both from the metal and from the ore of the district. The discovery, in 1876, of the very rare element gallium was the great achievement of Lecoq de Boisbaudran, who obtained it in extremely minute quantities from certain Westphalian zinc blendes. Some of its properties resemble those of nickel, and others those of aluminum: but it has qualities of its own rendering it specially remarkable among the metals. It would be interesting to learn to what extent it is found in Cleveland ironstone. The Westphalian blendes used by Lecoq de Boisbaudran contained, according to Adolphe Wurtz, only one sixty-thousandth of a part of gallium. The element was predicted, with most of its properties, under the name of "ekaluminium," by the Russian chemist Mendelejeff, on the basis of the periodic law.

A COMBINED BED AND SOFA.

The object of the invention shown in the illustration, for which a patent has been granted to Mr. Thomas Langdon, of South Los Angeles, Cal., is to combine in a single article of furniture a single or double bed, a sofa, and a separate, detachable, crib or berth. The device consists of a base to which are attached two stout end pieces, which are connected by a longitudinal partition centrally located between them. The body of the bed is hinged to the top edge of this partition, so that it may be thrown up, to form the back of the couch, or lie down horizontally, when it will rest upon said partition and upon folding legs which are suitably hinged at the front and rear of the bed. A hinged head board and foot board are provided, which are held in position by pivoted braces, and provided with locking bolts, which are controlled by springs and engage suitable holes in the sides of the bed when the same is folded up, thereby holding the clothes firmly in place. The sofa is located in the front compartment of the base, and consists of a cushioned top and hinged sides and ends, which are folded down when it is to be used as a lounge or sofa, the base of the bed being likewise cushioned to form the back of said sofa. If the sofa is to be used as a crib or couch, the front board of the latter is turned upward to form a side rail; and if a second single bed is required, in addition to the large bed, it is formed by taking out the frame of the lounge, turning the end



LANGDON'S COMBINED BED AND SOFA.

and side pieces upward around the cushioned top and latching them into position, the small bed thus formed resting upon two transverse pieces secured to the bottom of the cushion.

A Polar Region Map.

The United States Hydrographic Office of the Naval Bureau has just issued a map which embodies the entire history of North Polar exploration. It is published in two sheets, which divide between them the entire area included in the Arctic circle, and with a marginal belt of four degrees outside it. In other words, the map covers the entire area of North Polar exploration from latitude 62° 30′ north. It is, of course, circular, and is drawn to so large a scale that the diameter of the great circle contained on the two sheets measures forty inches. The longitudes east and west from Greenwich are marked on the Arctic circle, and the latitudes on two great meridian lines which cross the map at right angles from 75° west (nearly the latitude of Washington) and at 165° west. The great circle of Lockwood and Brainard's nearest approach to the Pole, May, 1882, is drawn at 83° 24′ north, and the point where they reached that altitude is marked at 44° 5′ west. The history of every North Polar expedition and exploration of the coasts is indicated by a series of ingenious colored lines and tracings. They can be easily followed, and tell the story with absolute accuracy and in graphic terms. The amount of skilled labor and geographic detail incorporated in the map is enormous, and is saved from being confusing only by the large scale to which the map is drawn. Seventy-six distinct explorations are traced on the map, from Sir John Franklin's, in 1845, down to Peary's, in 1895. Eight nations are represented in these explorations—Great Britain, Germany, Austria, Norway, Sweden, Netherlands, Russia and the United States. The height of the land is marked in feet and the depth of the water in fathoms. The land is colored to a light gray and the water left white. The names on the map are not crowded and are most delightfully legible. The entire lithographic execution of the work is the best. We are at a loss which to pronounce the more admirable, the high degree of perfection reached in the printing or the judgment shown in avoiding unnecessary refinements and the overloading the surface with more names than it could carry clearly, as is done in the recent editions of Stieler. It was a good stroke of practical judgment which divided the entire Arctic circle between two sheets instead of giving it all in one huge, unmanageable sheet, an arrangement whose convenience any one who wishes to consult the maps often will appreciate at once. At the bottom a complete key to all the signs or symbols employed to indicate the polar explorations and expeditions, with the names of the explorers and the dates of their expeditions, is printed out in full. We are proud to see so great a work as this bearing the imprimatur of the United States Hydrographic Office; and, more than all, we are glad to have such a condensed clew map to tell in a few words the confused and confusing story of these heroic expeditions to show what each accomplished, and what the relation of one to the other is and what remains to be done. The map is issued at the low price of one dollar, which, says the Independent, barely covers the cost of publication.

A Trolley Without Poles.

Chemnitz, Saxony, two years ago banished horses from her street cars and substituted the trolley. In a report to the State Department, Consul J. C. Monoghan says one of the principal novelties of the adopted system is that no poles are used. The method of stringing wires is by means of ornamental rosettes fastened into the woodwork or walls of houses, having projecting hooks to which the wires are attached. These hooks are firmly fastened and are tested with seven times the weight they will be called upon to bear. Owners of houses, without exception, preferred to allow the use of their houses free rather than have posts on the sidewalk. The streets through which the cars wind their way are wider than Washington Street, Boston, or Westminster Street, Providence. The railway tracks, in conformity to the law, are level with the pavement, and accidents to vehicles of any kind are rare. The gage is narrower than in America, but the cars keep the track and run as rapidly and smoothly as in the United States. In the heart of the city they run 220 yards per minute, and in the suburbs 330 yards per minute.

The increase of traffic since the introduction of electricity in Chemnitz has been 60 per cent. The cars have no conductors. The motorman is the only person on board who represents the company. By doing away with conductors the company saves 44,000 marks annually. The fare is only ten pfennigs, or a trifle less than 2½ cents, on all routes, including transfers. Should 150,000 persons evade payment in twelve months, the loss would be only 15,000 marks. It would take 450,000 evasions in fare to offset the company's savings by dispensing with conductors' salaries. Among a people who pay for food and drink in restaurants, saloons, and gardens on their honor alone, it is unlikely that the company loses much. Culprits in this regard when detected are punished by having their names advertised in the newspapers as a warning to others. Fare boxes are attached to both ends of the car, so there is no such excuse offered as "difficulty in getting forward."

Experiments are being made in Dresden with storage batteries and underground conduits with a view to replacing the overhead system of railway propulsion in Chemnitz. The overhead trolley system has been very profitable. The system has worked perfectly for the past two years, and has much to commend it to cities bent on an overhead system.

Prompt People.

Don't live a single hour of your life without doing exactly what is to be done in it, and going straight through it from beginning to end. Work, play, study—whatever it is, take hold at once, and finish it up squarely; then to the next thing, without letting any moments drop between. It is wonderful to see how many hours these prompt people contrive to make of a day; it is as if they picked up the moments which the dawdlers lost. And if ever you find yourself where you have so many things pressing upon you that you hardly know how to begin, let me tell you a secret: Take hold of the very first one that comes to hand, and you will find the rest all fall into file, and follow after, like a company of well-drilled soldiers, and though work may be hard to meet when it charges in a squad, it is easily vanquished if you can bring it into line. You may have often seen the anecdote of the man who was asked how he had accomplished so much in his life. "My father taught me," was the reply, "when I had anything to do, go and do it." There is the secret—the magic word now! Make sure, however, that what is to be done ought to be done. "Never put off till to-morrow what you can do to-day" is a good proverb, but don't do what you may regret. —Merchant Sentinel.

© 1896 SCIENTIFIC AMERICAN, INC.

Notice.

A premium of $250 is offered by the SCIENTIFIC AMERICAN for the best essay on

THE PROGRESS OF INVENTION DURING THE PAST FIFTY YEARS.

This paper should not exceed in length 2,500 words.

The above-mentioned prize of $250 will be awarded for the best essay, and the prize paper will be published in the Special 50th Anniversary Number of the SCIENTIFIC AMERICAN of July 25. A selection of the five next best papers will be published in subsequent issues of the SCIENTIFIC AMERICAN SUPPLEMENT at our regular rates of compensation.

The papers will be submitted for adjudication to a select jury of three, consisting of—

Prof. R. H. Thurston, Cornell University.

Judge A. P. Greeley, Washington, D. C.

Prof. R. S. Woodward, Columbia University.

Rejected MSS. will be returned when accompanied by a stamped and addressed envelope.

Each paper should be signed by a fictitious name, and a card bearing the true name and the fictitious name of the author should accompany each paper, but in a separate sealed envelope.

All papers should be received at this office on or before June 20, 1896, addressed to

Editor of the SCIENTIFIC AMERICAN,
361 Broadway, New York.

Our Trade with Africa.

The New York Sun told recently of the great increase within a few years in the business of shipping mining machinery from the United States to South Africa. The growth of the general export business to South Africa for the last few years has been correspondingly great, and the increase during this year has been little less than phenomenal. During the year ending with last June the value of the exports was $5,000,000. Such has been the growth of business since then that it is estimated the exports for the year ending with the coming June will be at least $10,000,000. What this means will be seen readily by a glance at the figures for two or three previous years. The value of the exports for the year ending with June, 1894, was $4,122,912; that for the preceding year, $3,500,000; and that for 1892 was $3,400,000.

One reason for the increase of shipments is that now steamers are available for the South African trade. A few years ago the business of southern Africa was either so largely in the hands of the English or in such condition that only sailing vessels plied between here and South African ports. For the last three years steamers have been sent from here, and although no regular line has been in operation, there are firms which send steamers out pretty regularly now at the rate of about three a month. They are tramp steamers and they take cargoes out but do not return.

While comparatively few articles were sent formerly to South Africa from here, now almost every kind of commodity that this country produces is exported. Trade is drummed up, and Americans are pushing their interests vigorously. Only recently the Oregon mill interests have worked their way into the African continent, and steamers are sailing from the north Pacific coast to South African ports. Of course, the great bulk of the shipments from this country are made from the port of New York, but vessels are dispatched also from Gulf ports and others from San Francisco.

The shipments from the South are of wood. All the white pine used in South Africa is sent from this country. The shipments from San Francisco are said to be mainly of wheat. During the present year wheat has formed a very large portion of all the shipments from this country. The reason is that the African wheat crop failed, and the Australian crop was an utter failure.

What the future has in store for the business relations of this country and South Africa would seem to be almost without limit. One of the things which work against the shipping firms is Africa's paucity of good harbors. Harbor improvements are under way there, however, as for example at Port Natal, the port of Natal, where the depth of the channel at the bar was increased from 1882 to 1892 by seven feet and seven inches. The depth in 1892 was thirteen feet eight inches.

What America has to look forward to may be seen from a comparison of the figures of its exports and those of England. America's exports to South Africa were $3,500,000 in 1893 and England's were $46,000,000. The total exports of manufactures from this country last year were in the neighborhood of $200,000,000, or less than half of Germany's, and less than a quarter of England's. Yet American manufacturing plants are capable of turning out twice the amount of goods requisite for the supply of this country in a year. One of the things, not always spoken of as a manufacture, that South Africa got from here is $1,000,000 worth of rum, which was sent out in one year.

Naturally most of the exports for Africa are staples, but some fancy articles, among them bicycles, are being introduced there. A good many medicines are sent over. Everything in the line of cheap wooden furniture is shipped. Agricultural implements are sent in large numbers, mainly of the old fashioned kind, or what are now regarded as old fashioned, although some mowers and reapers are going out. The reason the demand is for wares of the old style instead of the labor-saving machinery is said to be, not that labor is cheap over there, but the farmers prefer to do things in the old way. A good many cheap plows are exported.

An idea of the variety of the shipments made from United States ports to South Africa may be gained by a glance at the manifest of the cargo of a ship now on the water. Among the goods there are lard and lard oil, shoe leather, leather, hardware, lamp goods, codfish, corn, flour, canned meats, axle grease, turpentine, varnish, manufactured wood, barbed wire, doors, handles, parts of plows, axes, cigarettes, canned fruit, baking powder, brooms, carriages, nails, apples, apricots, canned oysters, kerosene, wheat, clocks, medicines, evaporators, hams, stoves, wheelbarrows, dried fruit, sugar, cotton goods of many sorts, spokes and hubs of wheels, lubricating oils, crucibles, ropes, seeds, and iron pipes. One of the commission merchants speaks of having seen many tons of iron pipe loaded for Africa. Besides, there are in the cargo steam pumps and starch, plows, glassware, gloves, curtain fixtures, rubber goods, sporting goods, shovels, mining machinery, furniture and organs, whips, hay, clothing, soap, seeds, cartridges, galvanized oilers, wire mats, oats, lumber, nectarines, candy, can openers, tongues, hay cutters, iron bolts, refined petroleum, books, candles, paraffine wax, suspenders, playing cards, glucose, mail coaches, knives, electrical machinery and supplies, hammocks, paper bags, trunks, exterminators, tomatoes, sirup, white duck, Florida water, windmills, benzine, oil stoves, razor strops, coffee mills, essences, quantities of pain killers, copy presses, iron sieves, picture frames, bird cages, plated ware, watches, dental chairs, dress goods, catalogues, lawn mowers, scales, wooden horses, drugs, typewriters, paper, charts, rye, bicycles, typewriter supplies, lead pipe, paint, roofing, carts, trucks, canvas, canned salmon, feed cutters, and electrotypes.

In many, if not most, of these products there can be no competition between this country and England. Of course, England can send no wheat. In manufactured hardware, the supremacy of American goods is acknowledged. The English goods in this line, it is said, are heavy, without being any stronger than the American, and while the African residents stick by old methods in farming, they like light articles for hand use and for use round their buildings. The exports of doors and sashes and made up wooden ware generally, together with the metal fittings and fixtures that go with these things, are enormous. In structural iron goods the exports are light, which would argue that Africa is not yet anxious to have very tall buildings.

Ordinarily the time of the ship's passage from here to the African ports is about thirty days. It is cheaper to ship freight from here to those ports than from England. The freights are less. One feature of the trade of England and America with South Africa is the difference in their terms of sale. English merchants, the commission houses of this city say, are ready to give six months' credit to the African dealers, whereas American houses draw promptly for all shipments. Many of the African houses have London connections and the financing is done at the London offices, which simplifies matters for a New York firm.

There are said to be about twenty commission houses in New York sending goods to South Africa, and besides these there are, of course, a great many direct shippers, many of the large manufacturing firms making their own shipments. It is not so long ago that Boston did a large part of the shipping done by the United States to South Africa, but now the bulk of it is done from this city.

The steamers call at various ports around South Africa, Mossel Bay, Delagoa Bay, Tamatave, East London, Algoa Bay, Port Elizabeth, Port Natal, Cape Town, and so on. All the way to Delagoa Bay, the port of the Transvaal, the consignments go from here in the one ship. Goods for the Zambesi River country have to be reshipped at Delagoa Bay. English companies run coasting vessels from Port Natal, Delagoa, etc., northward and to Mauritius. Although Delagoa Bay is the port of the Transvaal, Johannesburg is the center toward which all lines of travel converge from the coast points, and it is the objective point for several railroads, although they will be pushed on to Bulawayo, in Matabeleland.

THE Egyptian government has determined to commence a geological survey. The work will be begun this year, and will take about three years for its completion. The estimated cost is $125,000. Capt. H. G. Lyons, R.E., who is at present engaged under the Public Works Department of the Egyptian government in superintending the excavation of the ruined temples of Philæ, will have charge of the survey.

Ravages of the Bicycle Craze.

We extract from an editorial in the Evening Post of June 2, in which the editor argues that the cause of hard times in most industries is owing to the bicycle. Theatrical managers say they have had the poorest season for many years, and that after patient and anxious search for the cause they have found it in the bicycle craze. They say that not only do young men and maidens, but old men and women save up their money in order that with it they may buy wheels. This of itself is disastrous to the theaters, but worse remains to be told; for having bought the wheels they ride on them in the evening instead of going to places of amusement. They ride also on Saturday afternoons, and in Chicago they ride so universally on Sundays that the theaters, which formerly gave successful performances on that day, have discontinued them. The Sabbatarian might find encouragement in this fact were it not true that the churches are suffering almost as severely as the theaters from the same cause.

Business men are as loud in their complaints as the theater managers. The watchmakers and jewelers say they are nearly ruined; that all pin money which the young people saved formerly with which to buy watches and jewelry now goes for bicycles; that parents, instead of presenting a boy with a watch on his twenty-first birthday, now give him a bicycle, and that all the family economy is now conducted with the object of equipping every boy and girl, as well as father and mother, with a wheel. The confectioner cries "me too" to this plaint, declaring that about all the business he does is in chewing gum, ice cream, and soft drinks, while his candies find few customers. The tobacco manufacturer says he is the worst hit of all, since few riders care to smoke on the road—for which there is reason for profound gratitude—and the journals of the trade say it is a fact that the consumption of cigars is decreasing at the rate of a million a day, the total decrease since the craze became general averaging no less than 700,000,000 a year. Instead of sitting idle and smoking most of the day, hundreds of men now ride, and smoke only when they are resting.

The tailor, the hatter, the bookseller, the shoemaker, the horse dealer, and the riding master, all tell similar tales of woe. The tailor says that so many men go about half the time in cheap bicycle suits that they do not wear out their good clothes half as rapidly as formerly. The hatter says so many of them wear cheap caps, in which there is no profit to the maker, that their hats last them twice as long as heretofore. The shoemaker says he is even worse off, for while they buy cheap shoes for the bicycle, they do not even wear these out, and they refrain from walking much in any kind of shoes whatever, so that his loss is almost total. The bookseller says people who are rushing about on wheels, days, nights, and Sundays, no longer read anything, and his business has become practically worthless. As for the horse dealer, stable keeper, and riding master, it is notorious what has happened to them. They are no longer "in it," and, like the horse, are a drug in the market. Even the saloon keeper groans, for he says that while many riders drink beer, the number who take "soft drinks" is much larger, while the number who take "hard drinks" is diminishing, which must be the case in a pastime which cannot be followed with an unsteady head.

But the greatest gainer of all is the American race. An eminent physician is quoted as saying that "not within 200 years has there been any one thing which has so benefited mankind as the invention of the bicycle," that "thousands upon thousands of men and women who till within a few years never got any outdoor exercise to speak of, are now devoting half their time to healthy recreation, are strengthening and developing their bodies, and are not only reaping benefit themselves, but are preparing the way for future generations which will be born of healthy parents." There is no doubt about this. As a people the Americans have never taken sufficient outdoor exercise. We have been a nation of dyspeptics, simply because we did not take sufficient physical exercise to develop and strengthen our bodies. The bicycle is a wonderful builder up and purger of the system. It not only abolishes indigestion and dyspepsia, but rids the system of that curse of middle and old age, rheumatism, and thus adds enormously to the national good nature as well as to the sum of national happiness.

As a social revolutionizer it has never had an equal. It has put the human race on wheels, and thus changed completely many of the most ordinary processes and methods of social life. It is the great leveler, for not till all Americans got on bicycles was the great American principle that every man is just as good as any other man, and generally a little better, fully realized. All are on equal terms, all are happier than ever before, and the sufferers in pocket from this universal fraternity and good will may as well make up their minds to the new order of things, for there will be no return to the old. The true philosopher under the new conditions was the watchmaker of the rural New York village who, when he found the demand for watches falling off, gave up dealing in them and went into the bicycle business.

© 1896 SCIENTIFIC AMERICAN, INC.

THE SKIRT DANCE.

The famous skirt dance may be defined as peculiar in the sense that it is not a dance as generally understood in stage parlance. The performer standing on the stage and dressed in voluminous attire, requiring, it is said, over a hundred yards of material, by slow motions comprising more arm movements than foot movements causes the light drapery to wave about in most graceful curves. The variety of shape and contour that can be produced by a skilled performer is endless. To add to the effect wands are used to extend the reach in the direction of the lines of the arms, and the greater control thus obtainable adds immensely to the effect. This dance was made famous by Miss Loie Fuller, whose reputation is now world wide. During the past season refinements and improvements introduced in it have made of it a new thing.

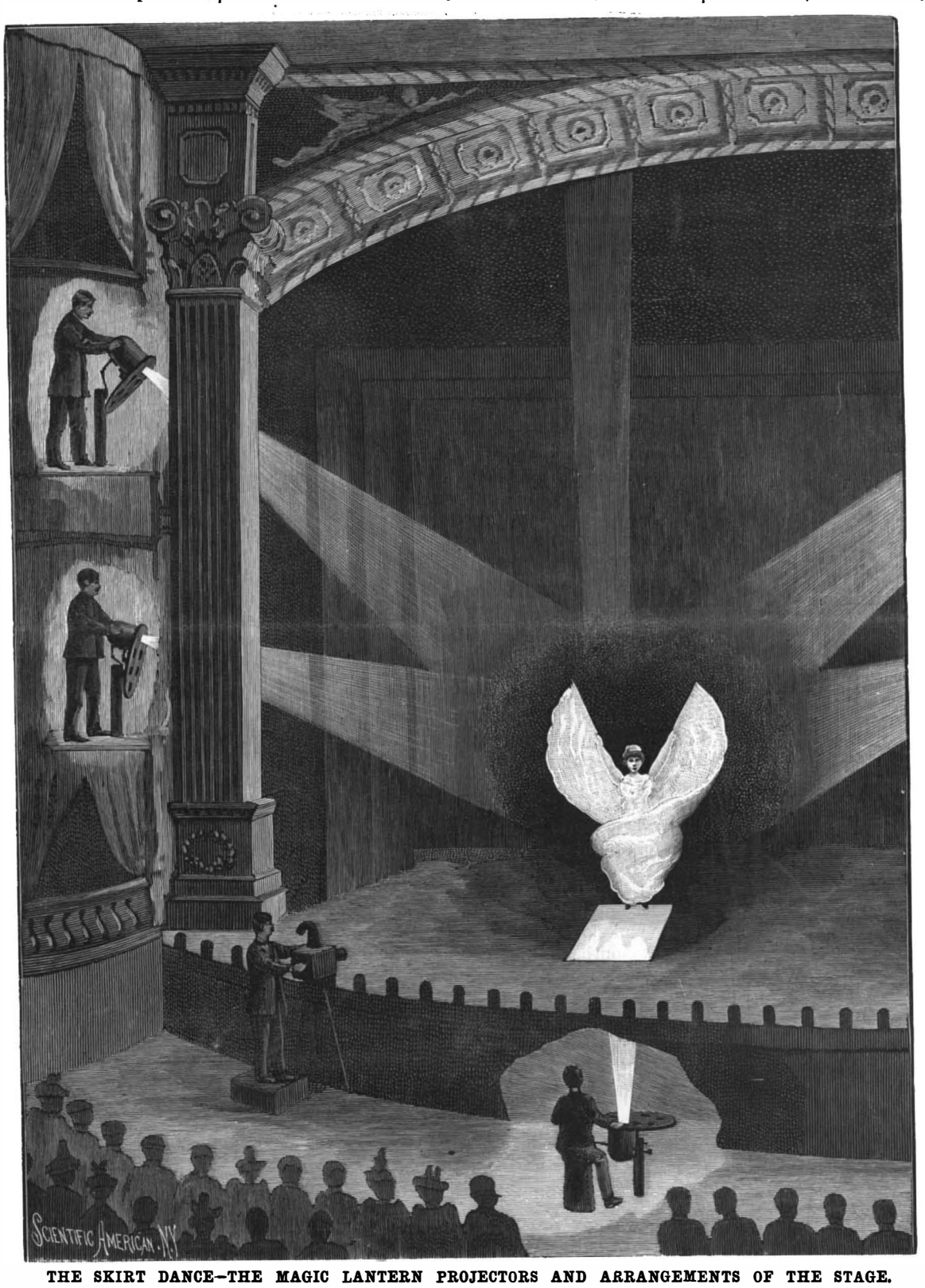
Our illustration is designed to show the methods adopted to produce the wonderfully beautiful effects which have characterized the dance. The performance is executed in a darkened theater. A number of projectors are distributed, four in the wings and one below the stage, so as to be adapted for flooding the figure of the danseuse with light. A pane of heavy plate glass set in the floor of the stage permits the projector beneath it to produce its effects. Each projector has mounted in front of it a disk about three feet in diameter, perforated near its periphery with a number of apertures. Colored gelatine is fastened over most of these apertures, a different color being used for each opening, except where one may be left for white light. The operators at the projectors follow the movements of the performer, and can produce an almost infinitely extended range of effects by varying the colors thrown by each projector.

The theater being pitch dark, the figure can be brought slowly into view and can be made to slowly disappear by manipulation of the projectors. She can appear in any color or combination of colors and can die away in similar manner. It is needless to say that it is a composite performance, in the sense that the dancer fills only a part of the functions; skilled operators are absolurely essential at the projectors.

One of the prettiest effects is produced by a magic lantern operated from the front of the stage and shown in the cut on the left hand. The operator projects upon the drapery different figures and designs, using regular lantern slides, making the flowing, misty drapery act as the screen for his projections. It is obvious that he must give great attention to his focusing.

The skirt dance has won the attention of artists, and some very beautiful statues have been based upon its cloudlike variations of form. The slight idealization required in representing the soft forms of waving drapery in the solid material of the sculptor's art has given most graceful and characteristic effects.

One of the most startling effects is the flame dance. The filmy veil is pure white, but as the dancer approaches the opening in the stage floor the veil turns to a fiery red and the flames wave to and fro as if they were being blown by the wind. Shadows are then thrown onto the veil which produce and exact reproduction of heavy black smoke, which suddenly changes to an ardent flame again, as if the fire had broken out anew



THE SKIRT DANCE—THE MAGIC LANTERN PROJECTORS AND ARRANGEMENTS OF THE STAGE.

THE Chemiker Zeitung states that according to Max Hagen the smoke of wood fires is not in the slightest degree injurious to vegetation.

Foundations of Heavy Buildings.

Several modes by which heavy buildings, such as those built in New York City, fail are described by Mr. Charles Sooysmith, M. Am. Soc. C.E., in a paper read before that society. The upper material of New York is mud, silt and sand of varying degrees of fineness and gravel. The hard stratum below, if not rock, is what is known as "hardpan," which contains stones of various sizes, is made up of silt, clay and gravel, and is firm and compact like rock in hardness and can only be dug out by pick and chisel. This hardpan is unyielding and can be trusted under the heaviest building. The Manhattan Life Insurance building, built on fifteen cassions proportioned to carry a pressure of 10·8 tons per square foot, is built on this material and has not yielded. It is said to be able to bear, by means of a concrete base, 150 pounds per square inch or 10·8 tons per square foot.

Mr. Sooysmith observes that buildings of the ordinary height seldom put upon the earth greater weight than three or four tons per square foot; their walls were spread over the surface by the means of footings and concrete. With the greater increase of the height of building, these methods became quite inadequate. One of the great dangers or risks from overloading the soil is lateral flow, and this has to be prevented by various means. When the foundations are not carried to the substratum of rock or "hardpan," it is necessary to discover what vent, if any, may be given for the underlying material by excavation or drainage near. The danger of the material squeezing out under the pressure, as in the case of buildings resting on sand, is very obvious, and the author alludes to the serious danger or disastrous settlement of heavy buildings, which may take place at any time, by excavations near them, even such as putting in foundations of buildings and in pumping operations, especially if accompanied by jarring, vibration or by hoisting. Under such conditions the material under the heavy building is likely to squeeze out toward the excavations. Pumping water near a heavy building from a well has sometimes caused settlement, owing to this tendency of the soil to escape.

Settlement of buildings is frequent in the vicinity of rivers, where there is often a movement of the entire mass of soft material going on, and an instance is given of one building which has been wrecked by the subsidence of the piers, the entire mass of the subjacent material or silt having slipped toward the river. Driving piles is one of the best preventives, especially where they are wholly submerged. The New York building law allows a load of twenty tons per pile. The author refers to the mistake of taking the aggregate bearing capacity of pile foundation to be the sum of the safe loads on the individual piles. In some cases the piles only displace the material and transfer the load direct to the stratum beneath them, which may be of a yielding kind.

The author also speaks of the risk of lowering the water level by pumping and so exposing the piles, which then soon decay; also of the raft method of foundation, which is employed largely in New York, in which steel beams are used to spread the bearing to a sufficient depth.

Reference is also made to the use of steel caissons sunk by the pneumatic process, employed by the architects of the Manhattan Life building, Messrs. Kimball and Thompson, and to the foundation of the new Johnston building by means of open wrought iron cylinders sunk by the water jet process. The pneumatic process, says the Building News, is one of the safest methods for deep excavation, and the author appears to favor it.

Electric Lighting by Artesian Wells.

One of the novel electrical developments of the West has been the operation of electric lighting plants by means of artesian wells. The latest of these is at Chamberlain, S. D., situated on what is known as the artesian well basin, embracing over 20,000 square miles in the central portion of that State. Throughout that region one can bore into the earth at almost any spot, and at a depth of about 2,000 feet obtain a constant flow of water to the surface, averaging about 1,000 gallons per minute. These underground waters may be regarded as a new resource, and in Brule County, where Chamberlain is situated, there are now over thirty such wells, yielding 70,000,000 gallons every twenty-four hours. At Chamberlain the well is 8 inches in diameter and 675 feet deep, and the water rushes up through sections of iron pipe, which penetrate through the strata of granite to the underlying body of water. The pressure is so great that if reduced to a 2½ inch stream by a nozzle, the water shoots up to a height of 262 feet. In the Chamberlain plant, the volume of water is reduced to a stream about 3 inches in diameter, which impinges on the buckets arranged radially on the rim of a well known type of Western wheel. This wheel is mounted on a shaft which carries a large driving pulley, and the pulley belts to a five hundred incandescent light alternating current machine. The power is more than sufficient to run the plant at its full capacity, and the five hundred lights are all in use. The regulation is simple, and is dependent upon raising or lowering the water nozzle at the wheel, and the power is thrown off entirely by swiveling the nozzle, so that the water discharges altogether under the wheel buckets, and runs out through the waste pipe. There is no reason why every one of the wells should not thus be made to yield its power for electric light and motor service as well as for irrigation.—New York Evening Post.

A Pasteur Institute has been established at Athens.

© 1896 SCIENTIFIC AMERICAN, INC.

MOSCOW AND THE CORONATION OF THE CZAR.

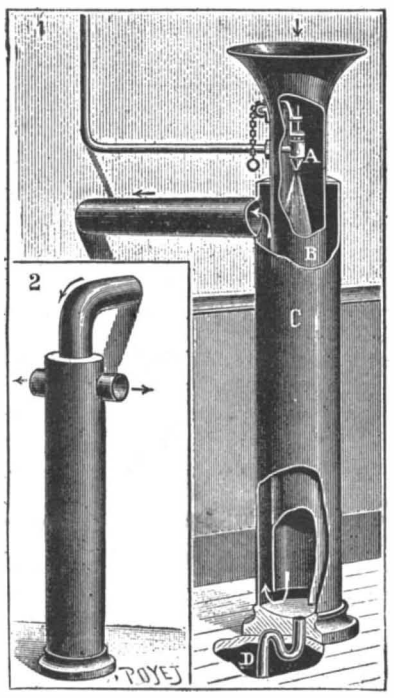
(Continued from first page.)

Resurrection, according to the immemorial custom, in order to venerate the picture of the Iberian Madonna, which is kept in a chapel at the side of the gate. Here their Imperial Majesties were met by the Metropolitan of Moscow, and after kissing the crucifix and making the sign of the cross with holy water, they entered the chapel and knelt before the sacred picture. They then passed through the Holy Gate of the Saviour into the Kremlin. (For our engraving of this event we are indebted to The London Graphic.) The imperial party prayed in the cathedrals and after a short rest left for the suburban palace of Alexandria. The next day their Imperial Majesties received the envoys of France, Spain, Japan, Corea and the United States, and that evening the foreign minister, Prince Lobanof, gave a reception to the foreign guests. On Saturday, May 23, the Czar received the representatives of Holland, Portugal, Turkey, Servia and Mexico, and Sunday the Czar and other members of the family were present at the consecration of the banner of the empire. On Monday the Emperor and Empress attended privately at the Church of the Saviour, in the Kremlin. On Monday afternoon, the transfer of the regalia from the armory of the Kremlin to the throne room of the palace took place. The regalia were carried in procession and reverently deposited on a table at the right of the throne, where they were guarded by high officials.

Very early on Tuesday, May 26, most of the inhabitants of Moscow were moving toward the Kremlin. The weather was glorious; the sun pouring upon the many gilded cupolas of Moscow and the Kremlin produced an indescribable effect. The regulation twenty-one guns announced the approaching event, and the signal was taken up by the bells of the cathedral, which was followed by all the other bells of the city. The Cathedral of the Assumption, in which the coronation took place, is unfortunately very small, eight hundred people standing elbow to elbow in a place intended for one hundred. Many of the costumes were superb.

The coronation took place at ten o'clock in the morning; but long before that hour the Church of the Assumption had been filled with the distinguished guests and representatives who had come from the four quarters of the globe to do honor in the name of their respective countries to the young Emperor and Empress. The United States were represented by Clifton R. Breckenridge the American minister, Gen. A. G. McCook, special representative of the American government, and Admiral Selfridge. At nine o'clock the imperial party approached the church amid the pealing of bells and the thunderous applause of the multitude. The first to enter the portal was the Dowager Czarina, mother of the Emperor, who ascended her throne on a dais level with the throne of the Emperor. Behind her came the Emperor and Empress, who were received at the portal by the clergy and escorted to the altar.

The Metropolitan of Moscow addressed a brief allocution, while that of St. Petersburg held a jeweled crucifix to their lips, and that of Kieff sprinkled them with holy water. After a few prayers the Czar stood to read his confession of faith. He was dressed in the uniform of the Preobragensky regiment. Then the actual coronation ceremonies began. One by one the Czar took the various papal insignia and the state mantle from the ecclesiastics. The crown was handed



BESSIERE'S HYDRAULIC VENTILATOR.

to the Emperor by the Metropolitan of St. Petersburg. Standing forth before the congregation and in front of the altar, he with both hands placed the crown upon his head; then taking the scepter in his right hand and the globe of empire in his left, he ascended the dais and seated himself upon the throne to the united accompaniment of salvos of artillery, martial music and the clash of the city's bells. He then arose, took off his crown, and touched the forehead of the Empress with it, after which she knelt before him and he placed her own crown upon her head. The Metropolitan then stepped forward to the foot of the dais and made a short address to the Czar on the importance and duties of his office, ending with these words: "With this visible and corporal adornment of thy head is clear proof that Christ the King of Honors invisibly crowns thee head of the Russian empire."

Family congratulations followed and a salute of 100 guns were fired. Next, mass began, and the Czar and Czarina went to the gates of the altar, where both were solemnly anointed with the holy chrism. The Czar was anointed in seven places, the Czarina only on the forehead. The Czar then used his privilege as head of the Greek Church and entered the sanctuary to receive the holy communion, the Czarina communicating outside the gates, like the ordinary laity. After the service was finished the imperial party left the cathedral, the Czar and Czarina going to pray at the tombs of their ancestors and various important shrines. At night the illuminations were on a magnificent scale. A bouquet was presented to the Empress at 9 o'clock, and, on her Majesty taking the pressure of her hand on the stem, instantly illuminated the flowers and simultaneously the whole Kremlin with electricity. Towers, cupolas, and walls of the palaces were ablaze with many colored lights till long after midnight, and search lights from towers threw their rays far over the city. Then followed a succession of fêtes, banquets, and receptions such as even Russia has rarely seen, and the congratulations of the foreign nations poured in.

Unfortunately, the round of festivities which followed has been marked by one of the most tragic calamities of the century. The popular fete of the coronation ceremonies was held on the Hodynsky Plain, opposite the Petroffsky Palace, where a free distribution of food and drink was made to the peasants. It is estimated that several hundreds of thousands were present, and in their eagerness to get near the distributing booths, the crowds surged forward, crushing those in front against the barriers, which yielded to the enormous pressure and were swept away. Hundreds of men, women and children were thrown down and trampled to death beneath the immense throng as it rolled forward. Including those who have since died in the hospitals, the fatalities will run into the thousands; and it is thought many have dragged themselves off the field to die, or have been carried away by their friends, of whom no account will ever be taken.

BESSIERE'S HYDRAULIC VENTILATOR.

Ventilation in premises inhabited by a large number of persons in common has for a long time occupied the attention of hygienists as well as of very many eminent scientists and distinguished investigators, and the problems that it involves have been well studied. In manufactories, barracks, hospitals, schools, and private houses, even, the air vitiated by respiration and all sorts of emanations must be constantly renewed; but it is also necessary that such renewal shall be done judiciously, and that in winter it shall not be attended with a lowering of the temperature. Many systems have been proposed—some of them automatic and based upon the difference of density of warm and cold air, such, for example, as perforated or movable panes of glass, etc. Others lay mechanical methods under

THE MONUMENT OF NICHOLAS I AT MOSCOW

THE GREAT BELL OF MOSCOW.

© 1896 SCIENTIFIC AMERICAN, INC.

contribution. In many theaters the air is now renewed by electric fans. All such methods are good, and it is solely a question of selecting the one that is best adapted to the place in which it is proposed to establish the ventilation. Despite the already large number of processes known, however, it is often found difficult to effect a constant renewal of air at slight expense, either because automatic methods do not give an adequate movement or because motive power is lacking. It is in order to obviate such difficulty that Mr. Bessiere has devised the system which we figure herewith and which operates through a simple water cock arranged in the form of an atomizer which consumes very little liquid.

As seen in the figure, the apparatus consists of a tube, B, open at both ends and inclosed in a second tube, C, closed at each extremity, from which start one or more exhaust conduits.

An atomizer, A, situated near the top of the internal tube projects a thin sheet of water having the form of an inverted funnel whose edges come into contact with the walls of the tube. The result is that there occurs a forcing of the air contained in the lower part and a section of that contained in the upper. The current of air thus established, finding no other outlet, escapes through the conduits starting from the outer tube, and is naturally proportional to the pressure and to the velocity with which the water flows. The ordinary pressure of city mains, which always reaches from two to three atmospheres, is sufficient. The water that has been used flows out through a siphon, D, and may, if desired, be employed for other purposes.

It will be seen that it is possible by this means, at will and according to circumstances, to suck the air from a room and force it out of doors, or, conversely, to suck in air from the exterior in order to introduce it into a room. Fig. 1 represents the first arrangement, and Fig. 2 the second.

It will be remarked that, by its very principle, when the apparatus operates as indicated in Fig. 2, it supplies air that is slightly moist, which, moreover, is desired in the majority of cases. But if it were necessary to have dry air, nothing would be easier than to obtain it by causing the current to pass over desiccating substances, such, for example, as chloride of calcium. If it is a question of purifying the air of a room, some such disinfectant as formol may be so arranged that the current shall pass over it.

The apparatus may be installed in each room to be ventilated by connecting each of them with the water conduit of the house, and, when the room is of very large dimensions, it is possible to install a battery of several ventilators placed side by side. The essential and even indispensable condition for obtaining a good rendering is to have an adequate pressure of water at hand. In case this did not exist in the city mains, it would be necessary to create it artificially, either by means of a pump or by placing a reservoir on the roof of the house.

The starting and stopping of the ventilators of this system are very simple matters, since it suffices to open or close a cock in order to effect one or the other. It is, therefore, possible to intrust the manipulation of them to anybody.—La Nature.

Concerning Crookes Tubes.*

We would offer the following contribution to the rapidly increasing literature on the X rays of Roentgen. It has to do with a part of the subject upon which very little has been written, and for that reason may be helpful to other experimenters.

One of the chief difficulties in the way of experimenting has been the cost of the bulbs or tubes. We have proved to our own satisfaction that the making of them need not be beyond the resources of the ordinary laboratory, for within a few weeks time we have made and tested more than one hundred tubes, and have frequently made one and exhausted it and used it, all within an hour's time. All that is required is some little skill in gas blowing and in the manipulation of the pump.

The Glass.—A hard German glass or its equivalent, free from lead, has proved the best. It gives a strong green fluorescence under the action of the current, and, what is of great importance, resists without softening the heat generated by the cathode ray at its point of impact. Unfortunately it is not to be had free from bubbles, and these are the cause of the destruction of many tubes, the glass being chipped away into the bubble by the action of the current and the tube ruined. It is also rather difficult to put in the electrodes so that they will stay, and it may be necessary to use three kinds of glass—first the tube itself, then a bit of softer glass, and upon that very soft lead glass for the seal.

Shape of the Tube.—A good tube should throw shadows as sharp as possible and develop the rays as powerfully as possible. It should easily appear that the ordinary spherical form meets neither of these conditions.

To produce a sharp shadow the radiant must be small. It was found that a picture could be taken upon any side of a spherical bulb, making it probable at least that the entire surface is a source of radiation.

In the matter of strong action also the spherical form is inferior. This is for two reasons. First, glass more or less extinguishes the rays, according to its thickness, therefore the larger the bulb the more opaque it must be, for it must be thick enough to stand the atmospheric pressure.

Secondly, there is a comparatively large amount of radiant or conducting matter within the spherical bulb which diffuses the energy of the discharge.

Proof of the second point was obtained as follows: A moderately thick bulb about three inches in diameter was blown, and upon this a spot one inch across was blown out very thin, forming a smaller hemispherical bulb upon the first. Opposite this thin window was the concave cathode. This bulb proved better than the ordinary sort, but far inferior to tubes about to be described. A second experiment was made with a tube blown thin along one side for a space of three inches, and opposite to this was the cathode in the form of a quarter cylinder. The performance of this was also inferior.

Without going into the details of many similar experiments, it will be sufficient to say that we have found that a simple straight tube from one-half to one inch in diameter, having a small and very thin bulb for a cathode window, has given the most satisfactory results. In length it may be from four to eight inches. The bulb may be blown at the bottom of the tube, the cathode placed at the top and the anode across the tube just above the bulb. Better results are, however, produced by using a bit of platinum foil for an anode, inclining it about forty-five degrees to the cathode ray. In this case the small bulb may simply be blown out upon the side of the tube and the electrodes put in at the two ends, so that the cathode ray will be reflected into the bulb.

Shape and Disposition of the Electrodes.—We have made the cathode in the form of a wire, a flat plate, a convex plate and a concave plate. The concave form proves the best in every case. We have made it of varying size up to an inch or more in diameter and have not come to any conclusion as to which is best. It is very difficult to have other conditions sufficiently uniform to enable one to judge where differences are small.

We have made the anode in the form of a wire of aluminum, a flattened strip of it, and, as stated above, in the form of a platinum reflector. As yet we have got our best results from the platinum. One rather interesting result obtained was that when the anode was in the form of an aluminum disk parallel to the cathode and nearly large enough to close the tube, it gave little or no interference with the X ray. We made one on a hinge so that it could be swung out of the path of the ray or in at pleasure, and the effect on the photographic plate was the same in either position.

Source of the Rays.—Being able to construct tubes of any form, we have made many experiments as to the source of the rays, whether from the cathode or anode. One was in this way: Two tubes were joined together parallel so that they were exhausted together. The cathode rays could be made to pass down one tube and the anode rays (if such existed) down the other, and either screened off at will. We found that the anode rays affected the plate but slightly, and that practically all the effect came from the cathode.

Intensity of Effect.—We do not intend to convey the impression that these home-made tubes we have described are simply good enough for experiment and valuable from their cheapness. We believe also that they are more effective than others. We have made good negatives of bones of the hand, arm, including the elbow, foot, ankle, etc., all with remarkably short exposures; have taken impressions perfectly distinct through nine inches of wood in less than five minutes; have taken perfectly the bones of the hand through thin sheet zinc in two minutes and through the slide of the plate holder in five seconds. The ordinary coin and key impression requires not over one or two seconds with our best tubes.

Remarks upon Pumping.—The interest in the subject at present may make some remarks upon pumping here in place, most of all, since many have found great difficulty in this respect.

It is here supposed that the pump has a three-way cock above its bulb, opening in its two positions between the bulb and fork and the bulb and outer air; and that above this three-way cock are one or two cocks of the ordinary kind. Let the three-way cock be called A, the others B and C in order. Let the position in which A puts the bulb in communication with the fork be position 1; and that in which it puts the bulb in connection with B, C, and the outer air, position 2. The ordinary process of pumping with the use of A alone is supposed to be understood. After a greater or less number of strokes it is observed that no more air is obtained. The pump contains air, however, condensed upon the glass walls. To remove this A is put in position 2, and the mercury raised until a drop passes B. B is then shut and the mercury dropped until only a drop remains above A. A is then shut and the movable mercury tank dropped to its lowest point, when A is put in position 1. Pumping now goes on as before only with B shut, and the tank is raised only a third as high as before. After four or five strokes it is well to pass the mercury again above B.

If the highest possible degree of exhaustion is desired, this process can be repeated between B and C, but this is not necessary in exhausting a Crookes tube.

As soon as the stage of pumping with B shut is reached, the tube which is being exhausted must be strongly heated, moving the lamp flame over every part of it, and after two or three strokes more the current from the coil is turned into the tube. By the combined action of the heat and current the occluded air is driven from the glass and exhaustion proceeds rapidly. It should not occupy over twenty or thirty minutes for a moderate sized tube.

Allowing the tube to cool, if short sparks can be drawn from the bulb and there is little or nothing to be seen in it except green light, the exhaustion is complete. There is danger of carrying it too far, for the vacuum very much increases during the first hour that the tube is used; but of these matters a little experience is the best teacher.

*By C. C. Hutchins and F. C. Robinson, in American Journal of Science.

Notice to Our Readers.

In order to obtain the opinion of the readers of the SCIENTIFIC AMERICAN as to what invention *introduced within the last fifty years* has conferred the greatest benefit upon mankind, we publish the accompanying card, which please cut out and return to the editor. Those who preserve the paper for binding and do not desire to deface their files, or who read this notice at a library, will please answer by postal card. It is desired to get as full a vote as possible. The result of the vote will be published in the *Special 50th Anniversary Number of the* SCIENTIFIC AMERICAN *on July 25.*

Editor of the SCIENTIFIC AMERICAN.

Dear Sir:

I consider that.....

.....

invented by.....

has conferred the greatest benefit upon mankind.

Name.....

Address .....

A Dog Iron Worker.

Keys, the canine employe of the Union Iron Works, met with an accident recently by which his front right leg was broken, says the San Francisco Examiner. Keys has been looked upon by the officers of the iron works as one of the regular workmen for about four years. He is a dog of no particular beauty, and his pedigree would not be considered by dog fanciers, but he possesses wonderful intelligence. He makes the Potrero Police Station his home, and he is the pet of Lieut. Bennet, but nearly every workman in the ship building concern claims the friendship of the dog.

At the first tap of the gong every morning Keys has reported for duty at the gates of the Union Iron Works, and he has never left until a full day's work had been accomplished. He was particularly useful in the ship yard and in the boiler shop, and the foremen of these departments say he was more valuable to them than a man for doing certain kinds of work. He could crawl through small holes in boilers and about ships, and his particular work was to carry tools, bolts, nuts, rivets and other small articles needed by workmen who had crawled into such places, and to have them creep back and forth for which would have caused considerable loss of time. Keys thoroughly understood his work, and he was always on hand when needed. Recently a steamer was placed on the dry dock for repairs, and the dog, realizing that his services might be needed by the workmen, was climbing a ladder to the deck when he slipped and fell about twenty feet. The men picked him up, and making a stretcher of some pieces of canvas carried him to the police station and sent for a physician to set the broken limb.

ACCORDING to Mr. Dewar, a liter of liquid air placed in a globular silver vacuum vessel and subjected to exhaustion, will produce as much as half a liter of solid air, which can be maintained in this condition for half an hour. In its solid state air is comparable to a jelly. When examined in a magnetic field, the liquid oxygen is drawn out of it to the poles. If pure, the jelly is clear and transparent. If it contains carbonic acid, it is milky.

© 1896 SCIENTIFIC AMERICAN, INC.

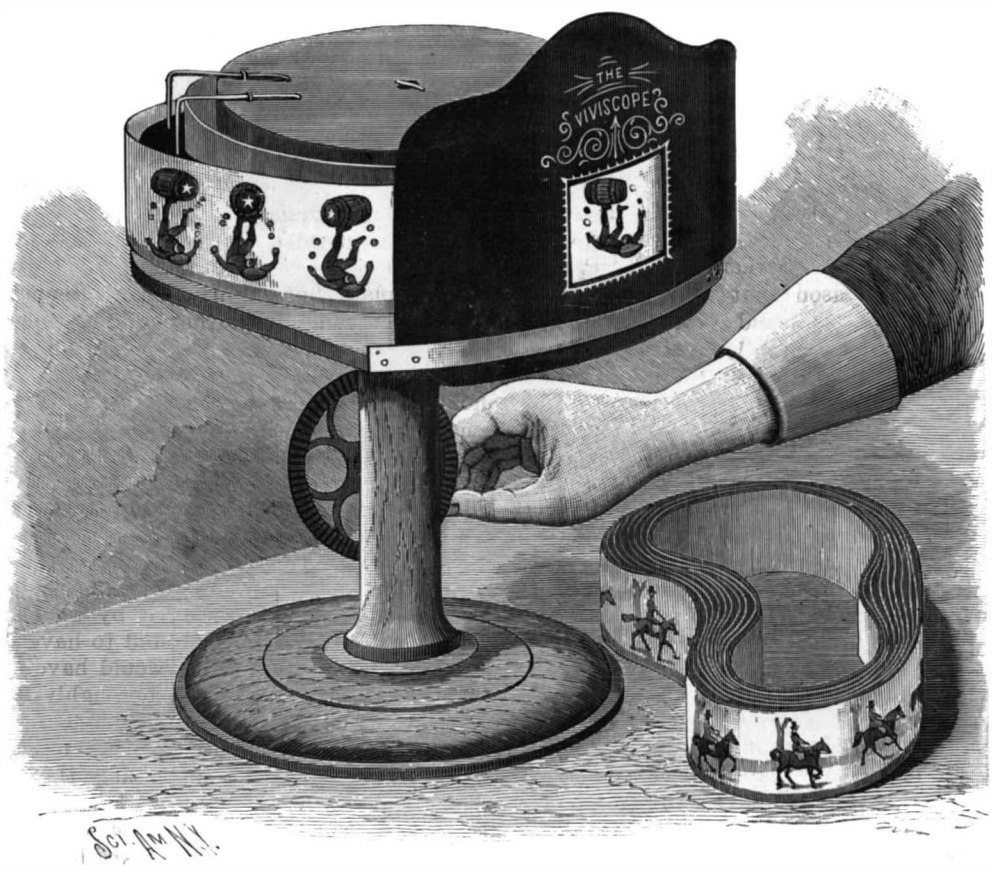
THE VIVISCOPE.

A great deal of ingenuity is devoted to the production of entertainment devices, and many most ingenious ones have been illustrated in our columns, but it is seldom that one more interesting, from the scientific as well as amusement standpoint, can be offered to our readers than the one we here illustrate. It is termed the viviscope. Supported on a standard is a circular stage. Concentric with the stage a circular block about eight inches in diameter is rotated by a hand wheel. This block is surrounded by a cylinder secured immovably to the circular stage. Attached to the disk are two wires projecting nearly radially from it and carrying at their outer ends a block of crescent shape and which depends directly over the perimeter of the stationary cylinder. As the hand wheel is rotated this block whirls around and around the cylinder.

With the viviscope are supplied a number of endless bands of paper with colored pictures of figures in progressive stages of movement, drawn on the zoetrope principle, the same as is followed in securing the photographs for the kinetoscope and vitascope. These bands have their ends pasted together and are of such length as to fit rather loosely over the stationary cylinder and the depending block. A screen with a hole is provided which is mounted on the perimeter of the circular stage, and through this aperture the spectator is supposed to see the figures. One of the beauties of the instrument is that the screen is not really necessary and that without it the movements can be seen by an entire room full of people. When the hand wheel is turned, the block whirls around between the stationary cylinder and the endless band with the figures on it. As the block passes under each figure, by a very peculiar principle of wave motion, the figure is shifted one space forward. Thus, for each rotation of the block, every figure on the band, which of course means the whole band, is shifted one space ahead, so that a perfect zoetrope effect is produced and the figures seem endowed with life.

The easiest way to figure to one's self the mechanical principle evolved is to imagine a rope secured to the floor at one end of a room and reaching clear across it exactly to the door sill opposite the wall, near whose base it is attached. Now let a footstool be placed beneath the rope near the fastened end. It is obvious that the free end will be drawn back, say a foot, from the door sill, and, of course, all the rope in front of the footstool will share the same displacement. Now let the footstool be moved forward toward the door. The rope will pass over it, and, as it is left behind by the footstool, it will regain its original place upon the foot. Each particle of the rope is left one foot in advance of the position it occupied when in front of the footstool. As the footstool is pushed out of the door the end rope will leave it and regain its original position with its end at the door sill a foot in advance of its position when the footstool was beneath the rope back of it. The difference between the rope illustration and the mechanism of the viviscope is that in the viviscope an endless band takes the place of the rope.

It will be obvious, we think, why this ingenious toy seemed worthy of a far more than passing consideration. It represents a most ingenious mechanical movement, one which may be termed paradoxical and which really is a good subject for the exercise of ingenuity in reaching a full and satisfactory explanation of its principle. Independent of this feature, it forms an excellent entertainment device, one whose principal charm consists in the fact that the figures are directly seen without the intermediation of any slot. The band, it will be noticed, is perfectly fixed in position, except such parts of it as the block passes under; the block being but one-seventh of the circumference of the cylinder, the band is stationary six-sevenths of the time. This gives the requirements for a kinetoscope, and the viviscope must, we think, be recognized as such. It is peculiarly timely now when the public has been so much interested by the exhibitions of the kinetoscope and vitascope, which have been witnessed by so many. Considered as a toy, it marks the only radical advance ever made on the construction of the old slotted zoetrope. It is manufactured by E. B. Koopman, 33 Union Square, New York.

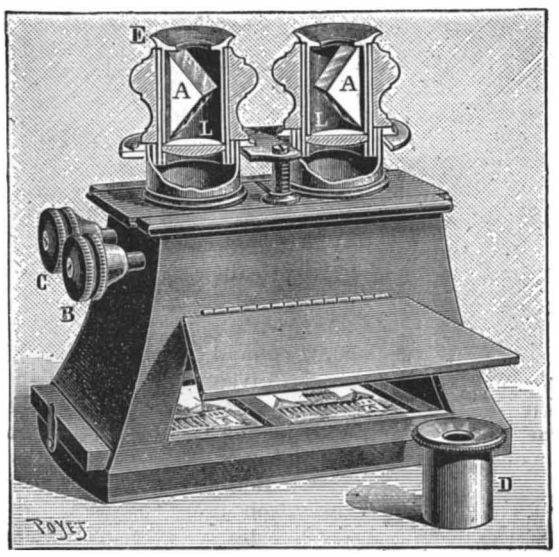


THE VIVISCOPE.

NEXT October a scientific jubilee will be held in honor of the fiftieth anniversary of first application of ether in surgical operations.

AN INVERTING STEREOSCOPE.

A photographer who, provided with a stereoscopic apparatus, should take it into his head to make a positive upon glass directly by contact with his negative would be much surprised upon afterward looking into his stereoscope to see the foreground transferred to the rear, while the background would come to the front. He would obtain what has been called pseudoscopy. This fact is well known to stereoscope amateurs, who also know that when they print a positive of their negative it is indispensable to put to the right the image that has been obtained to the left, and vice versa. The necessity of such inversion is demonstrated geometrically in taking as a basis an examination of



AN INVERTING STEREOSCOPE.

two truncated cones; but such demonstration would be too lengthy to reproduce here, and we refer those who desire to make themselves acquainted with it to special treatises.

However it be with theory, the fact is, nevertheless, quite annoying in certain cases. When a print is made upon paper, nothing is simpler, in order to conform to the rule, than to remember that it is necessary to separate the two images and to invert them upon the support upon which they are pasted; but if we print a positive upon glass, there is a slight complication, for it is then necessary either to cut the negative and afterward unite it in the proper direction or else make use of a special frame (of which there are several models) that permits of doing the printing in two operations, but without cutting anything. Now, stereoscopic views upon glass are from every point of view preferable to those upon paper, and tend to become more and more popular among amateurs.

Messrs. Carpentier & Gaumont have very recently constructed a style of stereoscope that permits of seeing the normal relief without making the inversion. To this effect, they utilize two small total reflection prisms, A, which they place in front of the lenses of the apparatus, as shown in the accompanying figure.

We know, in fact, that when we look through a prism of this kind in holding the hypotenuse face in a plane at right angles with that of the image, the latter is inverted, the right is transferred to the left, and vice versa. Now, to thus invert every image in place gives the same result as if one were shifted with respect to the other, provided, however, that we operate upon the wrong side of the image, without which the objects would not be found in their true direction, and, in case there were inscriptions, the latter, being likewise inverted, would become illegible. As it is a question here of transparent views only, there is no inconvenience in placing them wrong side up in the stereoscope.

It may be objected that with such a system it would be no longer possible to examine the views made up to the present and in which account has been taken of the necessity of transposing the images. But the manufacturers have anticipated this and have taken care to mount the prisms in a small tube which slides by slight friction in the piece, E, so that it is very easy to remove them (as seen at D) and then have an ordinary stereoscope. The focusing and the spacing of the objectives is effected by means of the buttons, B and C.

This new type of apparatus will contribute toward the dissemination of a taste for stereoscopic photography among amateurs, who have often been discouraged by the often inconvenient manipulation of which we have spoken.

It is now several years ago that Mr. Drouin conceived the idea of applying this principle of prisms for placing the stereoscopic image in its true direction in examining it upon the ground glass of the camera. To this effect, the operator provides himself with two small total reflection prisms mounted upon a jointed support, and, when he is under the black veil, he can obtain an exact idea of the effect that will be produced and find out what is the best position to give the objectives in order to obtain the maximum of relief.—La Nature.

Roentgen Rays Foreshadowed.

Mr. John P. Moss writes to the Daily News under the heading "Nothing New under the Sun," quoting the following paragraph from Dr. Priestley's Electricity, 1769, which, as he says, is interesting at the present time in connection wfth the late discoveries in photography. It describes an experiment made by Mr. Hawkesbee in 1709. "He (Mr. Hawkesbee) lined more than the half of the inside of a glass globe with sealing wax, and having exhausted the globe, he put it in motion; when, applying his hand to excite it, he saw the shape and figure of all the parts of his hand distinctly and perfectly on the concave superficies of the wax within. It was as if there had only been pure glass and no wax interposed between his eye and his hand." It does not seem possible, says Mr. Moss, to doubt that the extraordinary result of Mr. Hawkesbee's experiment originated from the same natural law that produces the photographic effects which have recently so startled the scientific world, but we fail to follow the logic of Mr. Moss.

In connection with the X rays, says Industries and Iron, a curious reference to a new light is made in the course of a lengthy paper on magnetism, by Baron Reichenbach, of Vienna. The date of this is 1846. The paper itself can hardly be said to call for much attention, but the curious part of it is the assertion of a "magnetic light" proceeding from the poles of a magnet, which could actually be seen by some peculiarly constituted individuals. In the account appearing in the Dublin Journal of Medical Science, at that time, it is stated that Baron Reichenbach, "in order to be certain that there was actual light given off in these cases, made some very careful experiments with the daguerreotype, the result of which was that an iodized plate was acted upon when placed opposite the poles of a magnet. He was also able to concentrate it with a lens, but the focal length was found to be 54 inches, while, for a candle, it was only 12 inches. He could discover no action of heat with the most delicate thermoscope. When the hand was laid before the poles, the light streamed through the fingers."

ACCORDING to Nature, the phenomenal Eichener Lake, in the Grand Duchy of Baden, which has the peculiarity of appearing and disappearing at uncertain periods, has recently again made its appearance after a lapse of time.

© 1896 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR FENDER.—Sylvanus D. Wright, New York City. The object of the invention is to provide a new and improved car fender which is comparatively simple and durable in construction, very effective in operation, and arranged to automatically compensate for the up and down motion of the car to hold the gate at all times in proper relation to the track. The invention consists principally of a fender platform mounted to slide vertically and lock normally in an uppermost position, and a gate in front of the said platform and adapted to unlock the same to permit the latter to drop by its own weight into a position to receive an object in the path of the car. The invention further consists of a compensation device of special construction to hold the gate always in proper relation to the track, irrespective of the up and down motion of the car.

CAR BRAKE.—Jefferson U. Elwood, McKeesport, Pa. This invention relates to certain improvements in car brakes, and especially that class of such brakes wherein the brake shoes are adapted to be forced into engagement with the track rails when it is desired to stop the car to which the brake mechanism is applied. It consists principally in certain improvements in the arrangement and operation of the brake shoes, whereby the same are arranged to bear in diagonally opposite directions against the track rails, so that the power required to stop the car is considerably lessened, and liability of breaking the rail tread or spreading the rails, so as to throw the car from the track, is greatly reduced.

Mechanical.

BARREL FORMING MACHINE.—John Hauenstein, New Ulm, Minn. This invention relates to machines for forming barrels, kegs, and other casks in which the two ends are contracted relatively to the center. It comprises a carriage adapted to support a barrel and to receive a hoop, a vertically movable contractible ring, means for raising and lowering said ring to engage the barrel staves near the ends resting on the carriage, and mechanism for operating the contractible ring to bend the ends of the staves inward, the end of the barrel when the staves are bent inward being adapted to be forced into the hoop held in the carriage.

WEATHER BOARD CLAMP.—William Kinderman, Troutville, Pa. The object of the invention is to provide a new and improved weather board clamp which is simple and durable in construction and more especially designed for drawing tongued and grooved weather boards together preparatory to nailing the same in place. It comprises a head adapted to engage the top edge of a weather board, the said head being provided near each, extending downwardly from the said lugs and screw threaded at their lower ends, a frame extending between the said rods and adjustable thereon, nuts screwing on the rods and adapted to engage the said frame to hold it in the adjusted position, a rack guided in the said frame and carrying a foot piece at its lower end, and means for imparting movement to the said rack.

SASH BALANCING DEVICE. — Porter Marshall, Fair Play, Mo. This invention relates to devices for operating window sashes, especially sashes of large size. It provides a means whereby the upper sash of a window frame may be raised and lowered by correspondingly operating the lower sash, whereby also the lower sash may be operated independently of the upper sash. In brief, the invention consists of strips angular in cross section and having sliding movement in the frame and of a connection between these strips and the upper sash, and gravity latches carried by the lower sash and adapted for locking engagement with the aforesaid apertured strips.

STEAM ENGINE GOVERNOR.—George W. Grimes, Bluffton, Ind. The object of this improvement is to provide a new and improved steam engine governor, which is simple and durable in construction and very effective in operation, and arranged to regulate the admission of steam to the engine steam chest according to the actual requirements, so as to maintain a uniform speed of the engine. The invention consists of a spring-pressed bracket mounted to turn and carrying the driving shaft, and a locking device held on the said bracket, and adapted to lock the admission valve stem in position to hold the said valve stem normally open.

BOILER.—Charles O'Toole, Dubuque, Ia. The object of the invention is to provide certain new and useful improvements in boilers, whereby all leakage is prevented and the tubes or flues are securely held in place in the boiler head, even should the usual beads be destroyed by the heat. The invention consists of a boiler head formed with an annular groove in the wall of the tube or pipe opening and adapted to receive a bead formed on the tube or flue.

AUTOMATIC FEEDING APPARATUS.—Charles E. Doster and William N. Fisher, Converse, Ind. The object of the invention is to provide a new and improved automatic feeding apparatus more especially designed for use on gas and other supply pipes to regulate the amount of gas passing to the burner, irrespective of the normal pressure in the main, and to cut off the burner from the main in case the pressure is reduced or the supply ceases entirely. The invention consists principally of a fixed valve casing and a valve having a hollow stem and fitted to slide in said casing, said stem carrying the burner.

SHUTTLE WORKER FOR LOOMS.—Lewin K. Heathcote, Glen Rock, Pa. This invention relates to looms, and its object is to provide a new and improved shuttle worker which is simple and durable in construction, very effective in operation, and arranged to insure a positive transmission of the shuttle through the open shed The device is provided with shuttle carriers moving in a longitudinal direction and carrying latches for securing the shuttle, the said shuttle carriers having levers arranged to release the said latches, the levers being actuated by revolving cams for the purpose mentioned.

LANTERN.—John T. Casey, Philadelphia, Pa. In this invention the object of the inventor is to provide a lantern particularly adapted for railroad service and in which it will be possible to readily change the color of the light, combining in one lantern the capability of shedding a red or white light. This object is attained by providing the lantern with a body portion capable of receiving a red shade which is vertically movable above the body portion so as to embrace the light. By these means it is possible to easily cover the light with a red shade so as to change light from white to red or vice versa. The red shade is provided with a rack and pinion device by which it may be operated, and the lantern throughout embodies various novelties of structure by which the advantages of the invention are enhanced.

GUIDE FOR SASHES, PARTITIONS, ETC.—Leonard L. Bishop, Montclair, N. J. This invention relates to guides or devices for doors, sashes, partitions, etc., and it has for its object to provide a means which will enable wide, heavy sashes, doors, partitions, or any object requiring to be raised between guides and balanced by weights or otherwise, to be raised easily and noiselessly, and to prevent the sash, when the device is used thereon, from catching or sticking, and likewise from rattling from wind or other causes. It consists of a plate for supporting a sash cord pulley provided near its upper end with an inwardly extending housing for the sash cord pulley, the portion of the plate above the housing being flat and the portion below the said housing being of much greater length than the upper portion, and provided with a longitudinal groove which, when the plate is applied, forms a guideway for a roller on a sash.

Electrical.

ELECTRO-THERAPEUTIC APPARATUS FOR TREATING DEAFNESS.—Samuel J. Collier, Chicago, Ill. This invention is in the nature of an improved apparatus for treating catarrhal and nervous deafness, and it consists in the peculiar construction and arrangement of an electrically operated apparatus designed to supply a mechanical massage to the ear drum, muscles and small bones of the ear, and at the same time to stimulate the nerves and muscles with a secondary current of electricity, both of said agencies being so arranged as to be made use of independently or conjointly, as may be desired. It comprises a box or case, a galvanic battery, an induction coil and an electro-magnetic sounder, both the coil and sounder being arranged in the box and in a circuit of the same battery, a switch for sending the current to either the induction coil or sounder, or both at the same time, tubular ear pieces having a tubular connection with the interior of the box, and wires leading from the terminals of the secondary coil to the two ear pieces.

THERMOMETRIC CIRCUIT CLOSER OR ALARM.—Richard Pearson, London, England. This invention relates to thermometric electric circuit closer, in which contact is effected by the contact of the mercurial column with platinum contact wires, one of which has always hitherto been in constant contact with the mercury. The objection to this arrangement is that the platinum wires become destroyed. In brief, the invention consists of a thermometer containing a mercurial column, two platinum wires forming the terminal contacts of the circuit and both entering the thermometer bore at such a point that neither is in contact with the mercury column at normal temperatures, and an insulating fluid contained in the bore between the mercury and the said contacts, said insulating fluid consisting of creosote free of fatty matter and having a boiling point of about 400 degrees Fahrenheit.

Agricultural.

CASTER ATTACHMENT FOR PLOWS.—George W. Waters, Corpus Christi, Texas. The object of this invention is primarily to provide a practical attachment for a sulky or other plow which enables the operator to readily turn the plow at any point where it may be desired, when the plow is in service; furthermore, to furnish a device of the above indicated character which will be especially well adapted to facilitate the turning movement of a disk plow and dispense with the use of a tongue to guide the plow. A further object is to provide a plow attachment of the caster type which is adapted for quick and reliable adjustment to turn the plow while moving, and which will be capable of holding the plow from turning until such a movement is necessary.

HAND GARDEN PLOW.—Launy Van Horn, Letts, Ia. The object of the invention is to construct a hand garden plow in such a manner that it may be utilized as a marker, a coverer, and a cultivator, and, furthermore, to provide for the lateral adjustment of the handle of the plow relative to the shanks thereof, the adjustment being accomplished in an exceedingly simple and expeditious manner and so that the plow will be thoroughly under the control of the operator. The invention consists in a hand garden plow, two beams of different lenghths, pivotally connected and provided with a locking device at their pivotal point, and interlocking teeth, and spring-controlled fenders carried by the beams, capable of assuming a position at the inner sides of the shovels or above the said shovels.

Miscellaneous.

TRACE HOLDER.—Reuben H. Ewing, Mondamin, Ia. This invention relates to whiffletrees, and its object is to provide a trace or tug holder for securely holding the trace or tug in place on the end of a singletree or whiffletree. It comprises a pin projecting from the end of the singletree or the like and a stirrup movably connected to the singletree, each stirrup having a free space between its members to receive the end of the trace, and being further provided with a slot or recess adapted to receive the said pin.

CONDENSED MILK CAN. — Arden A. Smith, Brooklyn, N. Y. This new condensed milk can provides a receptacle for condensed milk, and one which may be used on the table, and which will be incapable of leaking, and will also be susceptible to ready operation, and, above all, may be easily cleaned. It consists of a cup having an outlet opening, a slide by which to close the same, a spring in the rear of the slide and a connecting plate secured at its front end to the slide extending rearwardly and connected at its rear end to the spring, and having its portions in line with the rear edge of the slide deflected laterally to a point at one side of the slide, whereby, when the slide is open, a part of the connecting plate in the rear thereof will not be exposed below the outlet opening.

COMPOSITE MUSICAL INSTRUMENT.—William Langenfeld, Halbur, Iowa. This invention relates to musical instruments of the orchestrion type. Its object is to provide a composite wind instrument which is adapted to mechanically play musical composition by jointly blowing and moving the keys of a number of different wind instruments so as to produce harmony, the mouthpieces of some of the instruments having vibratile reeds, others being blown by the projection of an air jet directly into a perforation of the instrument. The wind for blowing the different instruments in concert is supplied by bellows, and the keys of the several instruments are actuated at the proper time by a longitudinally moved flexible sheet, having projections at proper intervals on its surface which engage and rock levers that are connected with the keys and valves of the different instruments. Devices are provided to sound the instruments in concert and for producing graduated pressure on the reeds.

GARMENT LOCKER.—John Peter, New York City. This invention relates to devices for temporarily supporting hats, umbrellas, canes, etc. It consists of a supporting rod having a locking bar which is capable of being secured to the door or wall, of a hat securer comprising a horizontally extended rod, a spring clip moving longitudinally for engaging the rim of the hat in connection with an adjustable supporting rod. A hanger for umbrellas is also provided, comprising a strip of flexible material having apertures in its ends and adapted to be bent around a handle or stick and an apertured handle on the ends of the said strip.

GARMENT SUPPORTER. — George B. Nichols, Little Rock, Ark. This invention relates to certain improvements in garment supporters and especially to devices of this nature adapted for use as skirt supporters; and the object of the invention is to provide a supporting device of this character adapted for use by ladies as a skirt supporter, the device being of such a construction as to hold the rear part of the skirt in place to prevent the same from slipping down, so as to expose the waistband below the basque and to remove the weight of the skirt from the hips of the wearer. The invention consists of a triangular or three-armed frame provided with hooks at the ends of its arms, two of which are adapted for attachment to the waistband of the skirt on opposite sides of the placket and the other hook being adapted for attachment to tapes secured to the rear of the corsets.

COMBINED TRAP AND GRAPPLING DEVICE.—Austin B. Clayton, Dover, Mo. The object of the invention is to provide a new and improved hooking and grappling device which is simple and durable in construction and designed for use in fishing and trapping animals and grappling lost or other objects in cisterns, wells, lakes, rivers and other places. The invention consists principally of stocks pivotally connected with each other and carrying at their free ends hooks, a central coil spring connected at its ends with said stocks and means for engaging the stocks at their pivots to cause the latter to close.

PLANETARIUM. — James M. Chaney, Independence, Mo. The invention relates to educational appliances, and its object is to provide a new and improved planetarium arranged to show at a glance the location of the planets and stars as seen from the earth at any time or place. The invention consists of a revoluble disk set to the angle of the latitude of the place of observation and adapted to receive rods, each carrying at its outer end the representation of a planet or star, the rods being inserted in the periphery of the disk to the angle of declination of the planet or star.

MINER'S CANDLESTICK.—Samuel Nash, Georgetown, Colo. This invention relates to that class of candlesticks which are employed by miners and others for supporting a candle, and the object of the invention is to provide a device of this character formed from a single piece of wire, having a socket to receive the candle, a spring section in combination with said socket to hold the candle in place therein, means for breaking off the drippings collected at the sides of the candle and supporting devices whereby the candlestick may be carried about. The invention consists of a wire candlestick formed with an arm for supporting it in position, the wire being formed into bends for receiving a candle, the wire further being crossed and formed into a yielding handle loop which is complementary to two opposite bends of the socket, a contraction of the handle serving to separate said opposite bends for releasing the candle.

KITCHEN CABINET.—Henry C. Wheeler, Carbondale, Pa. The invention relates to certain improvements in kitchen cabinets such as are employed for holding cooking utensils and the like, and the object of the invention is to provide a device of this character of a simple and inexpersive construction, which shall be compact and neat in appearance and provided with receptacles for holding utensils of different kinds, and which shall be adapted for use as a work table or kneading board in making bread. In brief, the invention consists of a kitchen cabinet, of a combination of a casing having a series of cross pieces arranged across its upper part and provided in its wall with a series of openings, a leaf hinged to the casing above said openings, a bar extending along the top of the casing and arranged to slide on said cross pieces, arms projecting from said bar and adapted when the bar is moved to pass through said openings in position to support the leaf when lowered, levers pivoted on the cross pieces and coupled together at their adjacent ends, one lever having its opposite end connected to said bar and the other lever having its end connected to the hinged leaf and also to the extended end of the said lever.

SMOKING TUBE.—Lewis H. Sondheim, New York City. The invention relates to that class of smoking tubes in which the tobacco is fed to the front of the tube as fast as it is consumed, and the object of the invention is to improve smoking devices of this character in several particulars. In brief, it consists of a smoking device having a central chamber for receiving the tobacco, the forward end of the smoking device forming a combustion chamber, said device further having a smoke passage exterior of the tobacco chamber, and a longitudinally movable stem adapted to be manually operated and fitting into the tobacco chamber, and having an axial bore in communication with said exterior smoke passage.

FREIGHT CAR ROOF. — Alfred P. Le Gros, Louisville, Ky. The object of the invention is to provide a new and improved freight car, which is simple and durable in construction and arranged to prevent moisture from penetrating into the interior of the car by way of the roof. The invention consists of a freight car roof, comprising a bottom layer of boards having grooves at the sides to form recesses between adjacent boards, top boards each formed with a bevel at its sides and longitudinal grooves in its top, and a layer of fabric between the top and bottom layers of boards.

FASTENING DEVICE FOR WINDOW GUARDS.—Lawrence F. Ryan, New York City. This new device relates to means for locking or fastening window guards and similar objects, providing a means whereby the window guard may be quickly and securely locked in place in a window frame and beneath the sash, and furthermore to provide a latch connection between the guard and the window sash, whereby the sash cannot be raised when the aforesaid connection has been made. In brief, it consists of a window guard having spring controlled locking members arranged for locking engagement with the window frame and a window sash serving to prevent the sash being raised or lowered, unless purposely intended, from the position in which it is placed with reference to the guard.

TOY FURNITURE.—James Edward Wilton, Minneapolis, Minn. The invention is an improvement in the class of toy furniture, such as chairs, bedsteads, etc., which is constructed of blanks cut from flat sheets of thin cardboard or sheet metal, and adapted to be folded into the required form or shape. The furniture being composed of a thin, semi-rigid, but foldable material, and including a central portion, a back portion adapted to stand vertical, side portions adapted to fold downward and serve as supports, and folding arms attached to the back and having tenons or points adapted to enter the slots in the central portion.

LINE INDICATOR FOR COPYISTS. — Charles L. Hastings, Jacksonville, Ill. The invention relates to that class of devices known as "line indicators" for copyists. The main object of the invention is to provide a line indicator with a pneumatic operating mechanism. It consists of a portable pneumatic line indicating apparatus, an air cylinder provided with a piston and adapted for attachment to a copy holder, a line indicator, connected with the piston rod; an air compressor, composed of a cylinder and base adapted for self-support, and a spring-supported piston working therein and having a projecting head, and a flexible tube which connects the said cylinder and air compressor.

TACK LIFTER. — Henry O. Detert, Louisville, Ky. This invention relates to tools for drawing either ordinary tacks or the double pointed tacks generally employed for securing matting to a floor. This tack lifter comprises a laterally curved shank portion, a vertical blade at the end of said shank and extended to a point, and a horizontally disposed blade having a notch in its forward end, one edge of said notch being at substantially right angles to the other edge, whereby a broadly diverging notch is formed.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE DYNAMO: HOW MADE AND HOW USED. By S. R. Bottone. Ninth edition, with additional matter and illustrations. London: Swan Sonnenschein & Company, Limited. 1896. Pp. 116. Price 90 cents.

Mr. Bottone is nothing if not practical. Those who wish to build dynamos will find this book of the most practical possible description, the theory being omitted by the author. Dynamo calculations are generally more or less complicated and somewhat difficult for the practical man to cope with, so it is hoped that in the present book the rule of thumb workman may find his peculiar methods of work assisted. It does, however, seem a pity for anyone to attempt to build a dynamo without investigating the practical mathematics of this subject.

HOW TO MAKE AND USE THE STORAGE BATTERY. Embracing its history, theory, maintenance, and the installation of plants. By P. B. Warwick. Illustrated. Lynn, Mass.: Bubier Publishing Company. 1896. Pp. 140. Price $1.50.

Various storage batteries are here treated in series, formulæ are given, and much useful data will be found embodied in the work. Quite a numerous list of "basic patents," as the author terms it, are given. Everything relating to the storage battery, now that it has become of general use in this country, will be considered of especial interest.

THE NAVAL POCKET BOOK. By W. Laird Clowes. With plans. London: Tower Publishing Company, Limited. 1896. Pp. 850. Price $2.

This book contains an account of the navies of the world, and describes ship by ship, giving the dimensions of each ship, her builders and state of completion being also given. Some useful data, notably the list of dry docks in Europe and America, with a very exhaustive index, are also given. The work we should consider one of very great usefulness, not only to those interested in the English navy, but for those interested in naval progress in all countries of the world.

THE POCKET LIST OF RAILROAD OFFICIALS. First Quarter, 1896. New York: Issued quarterly by the Official Railway Equipment Guide. Pp. 384. Price 25 cents.

© 1896 SCIENTIFIC AMERICAN, INC.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

Marine Iron Works. Chicago. Catalogue free.

High grade well drills. Loomis Co., Tiffin, Ohio.

For hoisting engines. J. S. Mundy, Newark, N. J.

"C. S." metal polish. Indianapolis. Samples free.

Mariner & Hoskins, Assayers, 81 Clark St., Chicago.

W. Hoskins & Co., Assay Furnaces, 81 Clark St., Chicago.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Screw machines, milling machines, and drill presses The Garvin Mach. Co., Laight and Canal Sts., New York.

Wet Tool Grinder, Sensitive Drills, for all light work, especially adapted for Bicycle work. C. N. CADY, Canastota, N. Y.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4, Munn & Co., publishers, 361 Broadway, N. Y.

Stay with your job, and with your wages pay installments for a profitable olive orchard. Booklet free. Whiting's Olive Colony, Byrne Building, Los Angeles, Cal.

Carpenters—Make more money. Investigate Ransome's Concrete Construction. Easily learned. Liberal terms for exclusive rights. Ransome & Smith Co., 758 Monadnock Block, Chicago.

Cripple Creek—Its History to Date, Illustrated.

Just out, with correct map and costly full page views natural as life. This great book will be sent free prepaid with our big 56-col. family paper 3 months on trial for 25c, (stamps or silver); club of 5, $1. Latest mining news. Mention the SCIENTIFIC AMERICAN and address Illustrated Weekly, Denver, Colo.

☞Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6879) C. L. says: Can you give me the formula and method of preparation of the so-called fire extinguishers in powder form? If not, can you advise materials to experiment with? A. 1. Fire Extinguishing Powder.—Eight parts common salt, 6 parts sodium bicarbonate, 2 parts Glauber's salt, 2 parts calcium chloride, 2 parts sodium silicate. 2. Common salt, 60 per cent; sal ammoniac, 60 per cent; sodium bicarbonate, 80 per cent. 3. Sal ammoniac, 100 per cent; sodium sulphate, 60 per cent; sodium bicarbonate, 40 per cent.

(6880) A. B. C. writes: 1. I have built a dynamo on lines one-half size of 8 light dynamo, using No. 14 wire on field and 19 on the armature. The machine works nicely and will quickly melt a piece of fine iron wire, but when connected to an ordinary Edison lamp it will not even make a spark. The lamp is one used on alternating circuit. Can you tell me what is the cause of failure? A. The voltage of the lamp is probably too high. Try a lamp whose voltage is adapted to your machine—say twenty volts or perhaps even less. 2. How much wire and of what size would be required to make an induction coil to give a ¼ inch spark? A. In our SUPPLEMENT we describe a coil which will at its best give a larger spark than the one you specify. One of about three-quarters the lineal dimensions of this one should answer your purposes.

(6881) J. R. T. asks: What number of heat units are given off by the combustion of one pound of ordinary kerosene oil when burned by a wick, as in an ordinary kerosene stove? What number of heat units are given off if the pound of kerosene is converted into a gas and burned as in an ordinary gas jet? And what number are given off if the gas, instead of being burned in an ordinary gas jet, be mixed with the necessary quantity of air and burned as in an ordinary Bunsen burner? A. The same quantity of heat is produced irrespective of conditions of burning, provided perfect combustion is produced. Allow 27,000 heat units per pound. The units will vary for different oils.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 9, 1896,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Air brake, T. Lindsey 561,596
Air brake, H. S. Park 561,811
Alarm. See Bicycle alarm.
Amalgamating apparatus, J. W. Hackett 561,952
Armature coils, form for winding, J. A. Webber 561,636
Armature for dynamo electric machines, F. P. Ide 561,590
Axle brake, J. W. Dudley 561,873
Baby jumper and chair, combined, J. B. Munson 561,908
Band cutter and feeder, W. McCaleb 561,909
Bank fixture, I. J. Barnes 561,753
Barrel elevator, C. A. Fry 561,782
Barrel elevator, A. Smith 561,827
Basket, metallic, J. R. Coleman 561,655
Bat, cricket, E. Sefton 561,618
Battery. See Galvanic battery.
Battery cut out, automatic electrical, Clelland & Madden 561,565
Battery element, electric, G. J. Ortner 561,810
Bearing, axle, A. J. Theiring 561,626
Bearing, ball, W. Briscoe 561,861
Bed, folding, W. Cole, Jr 561,654
Bed, sofa, P. Andina 561,751
Beer cooler, J. F. Theurer 561,740
Belt, garment supporting, J. M. Flannery 561,577
Belt, skirt supporting, J. M. Flannery 561,576
Beverages, apparatus for carbonating fermented, J. Z. Formel 561,879
Bicycle alarm, R. E. Kelly 561,667
Bicycle brake, L. A. Larsen 561,594
Bicycle brake, automatic, L. H. Guertin 561,885
Bicycle crank, extensible, S. Ayers 561,553
Bicycle frame, folding, S. Hubbell 561,665
Bicycle pump, automatic, J. K. Tomlinson 561,628
Bicycle sunshade, G. A. Conklin 561,767
Billiard chalk holder, J. W. Currier 561,659
Billiard table cushion, J. N. McIntire 561,911
Bin, R. M. Bixby 561,644
Binder, bank note, Hough & Reiber 561,889
Binder for loose sheets of paper, O. Assmann 561,932
Binder, temporary, J. R. Vail 561,928
Book, manifold account and sales, H. D. Keith 561,7 3
Book, manifolding, J. F. Laning 561,875
Books, detachable and interchangeable leaf binding for, L. Kosby 561,670
Booth, folding, C. Engert 561,703
Boring machine, G. T. Whitney 561,950
Bosbing apparatus, G. A. Dean 561,570
Bottle, L. C. Kendall 561,668
Bottle holder, nursing, M. M. Falion 561,877
Bottle packing case, S. Oakman 561,912
Bottle stopper, J. Goettel 561,883
Bottle stopper, A. L. A. Himmelwright 561,787
Box. See Cigar box. Folding box. Letter box.
Box cover, Eager & White 561,874
Box nailing machine table, B. S. Atwood 561,692
Boxes from paper board, etc., machine for manufacturing, A. Beran 561,858
Brake. See Air brake. Axle brake. Bicycle brake. Car brake. Vehicle brake.
Brake shoe, H. B. Robischung 561,815
Bridge guard, P. J. Kroehnke 561,671
Broom trimming machine, D. A. Devendorf 561,770
Buildings, erecting, J. Wenmaekers 561,637
Buoy or life preserver, C. H. McLellan 561,807
Button making machine, G. Carlyle 561,564
Buttonhole cutter, A. Eisenbart 561,775
Calendar, pencil, G. W. Johnson 561,666
Calipers, micrometer, S. H. Markham 561,802
Camper's kit, W. E. Baxter 561,756
Can labeling machine attachment, Cornell & Knapp 561,656
Canal lifts, water tight joint for, H. Lubowski 561,902
Cap opener, F. W. Brown 561,862
Car brake, D. L. Winters 561,845
Car controllers, arc interrupter for street, G. Valley 561,838
Car coupling, G. W. Dickey 561,572
Car coupling, F. G. Kammerer 561,895
Car coupling, G. W. Smillie 561,825
Car coupling, C. H. Taylor 561,835, 561,836
Car coupling, J. Willison 561,843
Car couplings, means for attaching, E. Grafstrom 561,784
Car motor, street, Dean & Snyder 561,769
Car roof, J. Voelkel 561,840
Car ventilator, J. McGarry 561,945
Cars, etc., reversing and cut out switch used in electric street, G. Valley 561,839
Cardboard bending device, T. Remus 561,814
Carriage apron, Wright & Curley 561,749
Carriage seats, cushion for back frames of, Wright & Curley 561,748
Case. See Bottle packing case. Dress case. Show case.
Cash register, J. E. Mellor 561,680
Cash register and indicator, C. H. Van Deusen 561,741
Cash register, indicator and recorder, J. A. Treat 561,837
Chair. See Folding chair. Rocking chair. Window cleaning chair.
Chime, electric, Gerry & Schmidt 561,881
Chime wheel, F. Agnew 561,641
Churn, D. M. Buerk 561,652
Cigar box, J. P. Dorticos 561,574
Cigarette or cigar, E. Moonelis 561,907
Clasp. See Corset clasp. Detachable clasp.
Clock, electric self winding, R. A. Mitchell 561,943
Clothes drier, S. T. Hollister 561,664
Clothes line end pin, J. J. Walsh et al 561,634
Clutch, friction, F. G. Hobart 561,940
Coke oven, Taylor & Dias 561,922
Cold storage apparatus, W. B. McCrosky 561,910
Communion apparatus, Ballard & Harper 561,854
Condenser and lint cotton conveyer, storage, W. A. Patterson 561,689
Conveyer, J. Guiler, Jr 561,582
Cooking apparatus, W. E. Baxter 561,856
Cooler. See Beer cooler.
Copying manifold sheet or book, carbon, E. J. Perry (reissue) 11,547
Corset, P. Lippmann 561,901
Corset clasp, O. M. Chesney 561,761
Corset fastening, W. A. Coles 561,866
Corset fastening, L. Kidder 561,795
Cotton lapper gate, A. Arnfield 561,853
Cotton press, F. Garraux 561,661
Counter, drawer, and show case, combined, W. R. White 561,743
Coupling. See Car coupling. Thill coupling.
Cover for cooking utensils, etc., R. Clayton 561,763
Cover for culinary utensils, L. W. Hammond 561,584
Cover for vessels, etc., R. Clayton 561,764
Cranes, etc., electrical apparatus for controlling motion of, Essberger & Geyer 561,777
Crate, poultry, J. H. Antrobus 561,852
Creamer, centrifugal, T. H. Springer 561,829
Culinary utensil, R. C. Cole 561,566
Curtain stretcher bar, W. C. Backof 561,693
Cuspidor, car, J. F. Miller 561,681
Cutter. See Band cutter. Buttonhole cutter.
Damper regulator, W. B. Mason 561,600
Dark room, portable, R. Daeschner 561,598
Dental engine, B. S. Brown 561,561
Desk, school, J. J. Feely 561,779
Detachable clasp for wearing apparel, J. H. & W. C. Stewart 561,736
Display fixture attachment, B. G. Casler 561,865
Ditching machine, O. Hetlesaeter 561,939
Dress case, telescoping, Nusbaum & Feldenheimer 561,808
Drier. See Clothes drier.
Dust collector and separator, R. W. Maske 561,599
Dust pan, E. S. Rothrock 561,917
Dye and making same, black azo, A. Blank et al 561,694
Dye, black azo, M. Herzberg et al 561,709
Dye, red azo, F. Runkel 561,615
Ear ring, V. Jansky 561,893
Egg tester, I. & J. Miller 561,906
Electric elevator, H. R. Smith 561,828
Electric generator, dynamo, B. G. Lamme 561,593
Electric machine, dynamo, F. G. Mayer 561,803
Electric meter, R. O. Hood 561,711
Electric motor, W. H. Cooley 561,699, 561,700
Electric motor and motor generator, W. H. Cooley 561,867
Electric switch, M. Guest 561,581
Electric switch, J. L. Hornig 561,598
Electrical accumulator, G. D. de Dormael 561,872
Electrical connection, T. Grutting 561,951
Electrical distribution system, C. P. Steinmetz 561,785
Elevator. See Barrel elevator. Electric elevator.
Elevator or other carrier, Martin & Parkinson 561,679
Engine. See Dental engine. Gas engine. Steam engine.
Engine cylinder head, J. G. Leyner 561,676
Engines, igniting apparatus for gas or explosive, G. E. Hoyt 561,890
Engines, igniting device for gas or petroleum, A. A. Hamerschlag 561,886
Engraving machine, G. W. Littlehales 561,677
Envelope, safety, M. Clarke 561,762
Envelope, safety, T. R. Jordan 561,894
Eraser, pencil holder and letter scale, combined, J. J. Walsh 561,635
Excelsior, machine for making, L. T. Kline 561,591
Fence, J. L. Woodward 561,849
Fence spacing device, wire, H. W. Alvey 561,642
Fence stay, wire, L. J. Woolsey 561,850
Fence, wire, E. A. & H. F. Barker 561,555
Fence, wire, J. A. Brackbill 561,757
Filter, C. A. Kunzel, Jr 561,673
Filter, C. K. Lamb 561,675
Firearm, gas operated, L. Schmeisser 561,617
Fire escape, portable, F. T. Stacy 561,733
Fireplace, J. R. Donaldson 561,871
Flag and lantern holder, A. F. Smith 561,826
Folding box, W. L. & A. Hensel 561,708
Folding chair, J. A. Koch 561,669
Folding chair for door stoops, E. Levinge 561,900
Folding stand, W. E. Baxter 561,857
Fruit gatherer, H. Edgarton 561,575
Fuel, etc., compound for producing artificial, G. D. Platte 561,725
Fuel injector, universal, Bryce & Kennedy 561,934
Furnace, W. L. Ross 561,817
Furnace and grate, J. G. Sanderson 561,729
Furnace bar, hollow, A. Pillatt 561,605
Furnace grate, steam boiler, F. R. Tibbitts et al 561,627
Furnaces, draught tube for locomotive boiler, G. C. Sharpe 561,621
Furniture base, W. F. Woodruff 561,745
Galvanic battery, T. E. Fogalsang 561,878
Game apparatus, F. L. Decker 561,869
Game apparatus, baseball, W. H. Robinson 561,916
Gas engine, Eggerdinger & Swaine 561,774
Gas generators, steam distributer for, J. H. Baker 561,752
Gas, producing acetylene, E. N. Dickerson 561,701
Gate, C. G. Deloye 561,870
Generator. See Electric generator. Thermo-electric generator.
Gin saw filer and gummer, A. P. Gathright 561,580
Glass, machine for embedding wire in, F. Shuman 561,920
Glove fastener, F. T. Simmons 561,623
Grate bar, J. Wagner 561,632, 561,929
Gutter, roof, J. R. Bryant 561,563
Hame, A. W. Smith 561,731
Handle. See Pick handle.
Harrow, Babcock & St. John 561,643
Hatchet, nailing, M. Ortenblad 561,869
Hay press, A. Gibeault 561,882
Heating and ventilating system, C. P. Noble 561,688
Heel attaching machine, F. F. Raymond, 2d 561,608
Heel nailing machine, F. F. Raymond, 2d .. 561,607, 561,611
Hoisting and pumping apparatus, F. H. Nease 561,723
Hook. See Unchecking hook.
Hose reel, C. H. Briggs 561,759
Huller. See Pea huller.
Ice cream mould, A. L. Riggs 561,727
Index, book, J. Hon 561,888
Indicator. See Music indicator.
Jacquard mechanism, harness connection for, F. Lewis 561,801
Kitchen cabinet, P. Pfender 561,690
Knife. See Leather splitting knife.
Knife, F. H. Wilks 561,842
Knife polisher, Cloud & Tull 561,765
Knit fabric with backing, ribbed, D. C. Bellis 561,558
Knitting machine, D. C. Bellis 561,559
Knitting machine spotting feed, B. Thackrah 561,739
Knockdown table, F. Ritter 561,612
Lamp, electric arc, S. Bergmann 561,560
Lamp wick tube, N. D. Ingram 561,789
Lantern, E. M. Rosenbluth 561,816
Lantern for use in manufacturing pipes, E. M. D. Andre 561,691
Lasting machine, J. M. Holladay 561,887
Latch and operating device, gate, T. Smith 561,732
Lathe for turning spiral patterns on sticks, C. J. Petersen 561,724
Lathe for turning wood mouldings, etc., G. E. Mertz 561,720
Leather slitting knife, F. J. Bringham 561,860
Letter box, E. G. Hower 561,589
Lock, A. Josler 561,941
Log skidding apparatus, W. Baptist 561,855
Log skidding device, H. J. Kuriger 561,674
Loom, Beaumont & Faulds 561,933
Loom, W. Weaver 561,841
Loom, lappet, J. T. Bolton ..... 561,646 to 561,649
Lumber loading apparatus, H. G. Wadley 561,631
Mail matter, apparatus for and method of collecting and delivering, D. di B. Savorgnan 561,819
Mattress frame, Mueller & Preuss 561,684
Measuring and registering apparatus for liquids, automatic, F. Vanderpool 561,948
Measuring can for dispensing liquids, J. H. Martindale 561,718
Measuring instrument, electrical, H. A. Rowland 561,918, 561,919
Meter. See Electric meter.
Mill. See Sawmill. Windmill.
Mould. See Ice cream mould.
Mould, J. D. Baker 561,554
Motor. See Car motor. Electric motor. Rectilinear motor.
Motor, M. M. Montgomery 561,722
Motor stop, automatic, Wood & Miller 561,846, 561,847
Multicolored screen, J. W. McDonough 561,686
Music indicator, M. & I. J. Morgan 561,805
Music leaf turner, G. W. Farmer 561,778
Musical instrument, stringed, W. Robinson 561,915
Musical instruments, resonator for stringed, D. Mayer 561,903
Mustache guard, J. E. a Dal 561,868
Nail distributer, F. F. Raymond, 2d 561,610
Nailing machine, gang, F. F. Raymond, 2d 561,609
Neck shield, C. Stottmeister 561,737
Numbering head, J. H. Reinhardt 561,946
Numbering machine, F. Sanders 561,818
Nut, O. Paquette 561,913
Nut lock, J. A. Ensley 561,776
Nut lock, J. G. Perry 561,604
Nut, lock, E. Thiange 561,923
Nut, sectional, E. B. Brewer 561,758
Nuts, machine for making coils for lock, T. Gare 561,579
Ore concentrator, L. R. Tulloch 561,629
Ore concentrator feed mechanism, L. R. Tulloch 561,630
Oven, portable, Yanner & Pfeiffer 561,750
Packing, metallic rod, J. Kelley 561,794
Paper feeding machine, T. C. Dexter 561,772
Paper feeding machines, feeder's helper for, T. C. Dexter 561,773
Paper folding machines, packing box for, T. C. Dexter 561,935
Paper, machine for registering sheets of, T. C. Dexter 561,771
Paper registering machine, T. C. Dexter 561,936
Paper registering mechanism, T. C. Dexter 561,937
Peahuller, J. M. Sanders 561,616
Pencil, magazine, J. W. Steele 561,734
Penholder, combination, J. A. Larsson 561,897
Photographic negative, J. W. McDonough 561,687
Photographic printing frame, J. W. McDonough 561,685
Photographic shutter, J. Kruse 561,672
Pick handle, J. B. Pouk 561,726
Pictures, process of and apparatus for copying, L. D. Langworthy 561,797
Pipe drying apparatus, H. B. Lynch 561,713
Pipe, method of and apparatus for coating, H. B. Lynch 561,712
Pipe or bar for coating with metal, method of and apparatus for preparing, H. B. Lynch 561,716
Pipe or bar iron, storage floor for, H. B. Lynch 561,715
Pipe or bar, method of and apparatus for pickling, H. B. Lynch 561,714
Pipe wrench, E. B. Frizelle 561,578
Pitman, A. J. Williams 561,639
Planter, corn, S. H. Jones 561,791
Plants, convertible cover and pot for, E. Siskron 561,824
Plastic compositions, making articles from homogeneous, T. G. B. Goldmann 561,938
Plow, W. Strait 561,625
Plow, revolving, F. Marshall 561,717
Plow, wheeled, W. N. Curtis 561,768
Postmarking and stamp canceling machines, marker for, M. J. Dolphin 561,573
Powder charges, implement for measuring and weighing, T. R. Barney 561,754
Power, etc., by means of heat of the sun, apparatus for producing motive, C. G. O. Barr 561,755
Power transmitting device, D. A. James 561,953
Press. See Cotton press. Hay press.
Pressure regulating device, Westinghouse & Welsh 561,949
Printing device, hand, F. C. Boynton 561,859
Printing presses, operating gripper tumbler cams in, Yates & Huson 561,640
Projectiles, means for throwing, J. Ericsson 561,954
Pulp pail making machine, E. Hubbard 561,793
Pulverizer and blower, H. C. Witmer 561,744
Pumice stone, artificial, C. Morgenthaler 561,683
Pump valve pot, C. C. Worthington 561,746
Punches, manufacturing stencil character, S. D. Hartog, Jr 561,785
Purse, E. A. Thiery 561,924
Puzzle, J. L. Mahoney 561,678
Pyroxylin compound, J. H. Stevens 561,624
Rail bond, L. Cook 561,698
Railway, electric, P. W. Leffler 561,898
Railway, electric, W. M. Schlesinger 561,821
Railway, electric, C. E. Stanley 561,830
Railway rails, device for bridging open joints of, T. S. McKinnie 561,602
Railway semaphore signal, H. M. Abernethy 561,551
Railways, automatic semaphore signal for, H. M. Abernethy 561, 31
Razor, safety, E. J. Fuchs 561,707
Rectilinear motor, continuous current, P. W. Leffler 561,899
Register. See Cash register. Telephone register.
Revolving screen, C. Law 561,595
Riveting machine, N. W. Pratt 561,606
Roadbeds, machine for shaping surfaces of, D. A. Walker 561,633
Road making machine, O. E. Moats 561,804
Rocking chair, revolving, V. A. Menuez 561,719
Ruler, blackboard, M. A. Harris 561,585
Salol, substituted, B. R. Seifert 561,730
Sandpapering machine, E. J. Bein 561,557
Sash fastener, F. B. Townsend 561,927
Sash lifter, P. M. Krickl 561,896
Sash locking and operating device, A. L. Schiller 561,820
Sash, removable window, J. Lehnbeuter 561,800
Sawmill, M. E. Davidson 561,569
Sawmill carriage offsetting mechanism, P. J. Buck 561,864
Sawmill set works, C. H. Knight 561,592
Sawing machine, C. M. Hillebrand 561,587
Scale pan, weighing, G. S. Forschner 561,704
Screen. See Multicolored screen. Revolving screen.
Screw machine, E. E. Claussen 561,697
Seal for vessels containing liquids, N. C. Patterson 561,812
Sealing device, bottle, L. Kalling 561,792
Sealing preserving jars, device for, G. Fuerth 561,783
Seed delinter, cotton, J. J. Faulkner 561,660
Sewing machine tension operating mechanism, A. W. Johnson 561,790
Sewing machine thread cutting device, C. H. & T. E. Colby 561,766
Sewing machine trimming attachment, W. A. Polmateer 561,813
Sharpener, scissors, W. Titus 561,926
Shirt, G. H. Addinsell 561,851
Shoe, A. M. Bollinger 561,645
Shoe, congress, E. D. Friswell 561,706
Shoestring fastener, H. H. Abell 561,550
Show case, J. T. Robin 561,613
Shutter worker and fastener, J. A. Thomas 561,925
Sifter, ash, B. M. Schauman 561,947
Signal. See Railway semaphore signal.
Skins, leather, etc., machine for treating, J. Hall 561,583
Spark arrester, J. T. Bright 561,695
Stand. See Folding stand.
Steam engine, J. W. Nitcher 561,603
Stereoscope, H. S. Walbridge 561,930
Stool, S. Fuerstenberg 561,880
Stopper. See Bottle stopper.
Stove, heating, A. G. Gray 561,662
Sulfids, treating mixtures containing, F. P. Dewey 561,571
Switch. See Electric switch.
Table. See Knockdown table.
Tack delivering nozzle, C. E. Stewart 561,832
Tack driving machine, H. E. Stevens 561,833
Tapping machine, pipe, F. Sharp 561,620
Tea infuser, J. H. Sutthoff 561,921
Telegraph operator's arm rest, Brownson & Goodro 561,562
Telegraph relay, E. Butler 561,653
Telephone line toll counter, G. P. Seligmann-Lui 561,619
Telephone register, E. L. Morey 561,601
Theodolites, traversing and leveling head for, W. G. Entwistle 561,876
Thermo-electric generator, H. B. Cox 561,657
Thill coupling, C. C. Brown 561,651
Thill coupling, J. B. Legate 561,799
Thrashing machine, R. H. Avery 561,552
Timing instrument, vehicle, E. G. Dorchester 561,702
Tire, pneumatic, P. Mercier 561,904
Tire tightener, D. I. Lybe 561,598
Toaster and broiler, F. S. Rudge 561,728
Tobacco case, P. Hearsch 561,586
Tongs, multiple, J. F. Steward 561,831
Tool, combination, A. Lippe 561,397
Top, spinning, A. P. Monnier 561,944
Toy, S. B. Field 561,781
Trousers stretcher, W. T. Brown 561,863
Trousers stretcher, W. J. McCoy 561,806
Turning wood mouldings, rotary cutter for, G. E. Mertz 561,721
Typewriting machine, A. W. Street 561,834
Unchecking hook, Ferris & Hart 561,780
Valve, W. Curlett 561,658
Valve, W. H. Wilder 561,638
Valve gear, engine, C. W. Chadwick 561,696
Valve, steam dash, C. C. Worthington 561,747
Valve, steam engine, I. N. Moore 561,692
Valve, throttle, J. V. Beekman 561,556
Vehicle brake, J. A. Frazier 561,705
Vehicle wheel, J. W. Jacobs 561,892
Vehicle wheel, J. R. Terry 561,738
Veil holder, M. E. Cartwright 561,760
Velocipede, B. C. Hicks 561,710
Velocipede, H. J. Lawson 561,798
Ventilator. See Car ventilator.
Vessels, receptacles, etc., material for protecting, P. Mercier 561,905
Vise, G. A. Gumphert 561,663
Wagon, W. O. Shadbolt 561,822
Wagon, folding, V. Krotzinger 561,796
Wagon, self measuring oil, A. Bowser 561,650
Watchcase pendants, mechanism for making, Mink & Moore 561,942
Water purifying compound, J. B. Greer 561,884
Weaving, means for, R. Simon 561,622
Weigher and sacker, grain, J. M. Welbourn 561,742
Welding apparatus, C. L. Rowland 561,614
Wheel. See Chime wheel. Vehicle wheel.
Whist, apparatus for playing duplicate, L. W. Heath 561,786
Windmill, Peterson & Curtis 561,914
Window cleaning chair, H. G. Wilmerling 561,844
Window or skylight operator, J. Woodall 561,848
Wire stretcher, W. C. Hudson 561,891
Wrapping machine, newspaper, L. C. Crowell 561,567
Wrench. See Pipe wrench.
Wrench, J. Shafer 561,823

DESIGNS.

Bicycle bag, L. Dennies 25,618
Bicycle package carrier frame, T. Hoermann 25,619
Bicycle saddle, M. M. Garrison 25,620
Bottle opener frame, J. T. Burt 25,608
Bridle holder, S. Donahey 25,613
Button hook, J. L. Sommer 25,602
Cane head, J. T. Morris 25,604
Carpet, F. M. Parker 25,630
Carpet, N. S. Stewart ..... 25,627 to 25,629
Cartridge shell, J. Gardner 25,611
Cork extractor frame, M. Redlinger 25,607
Eyeglass hook, S. J. Clulee 25,603
Fence fastener, J. Harris 25,614, 25,615
Game board, P. Rafalovitz 25,624
Hammock, I. E. Palmer 25,625
Horse bed or mattress, W. H. Burt 25,626
Jar, A. Gaskill 25,617
Lamp globe, arc, C. L. Danforth 25,616
Match, J. T. Commoss 25,612
Paper knife, H. C. Kirk, Jr 25,605
Pencil, lead, A. Kaiser 25,606
Pocketbook, etc., P. O. Dickinson 25,600, 25,601
Pump chamber casing, C. C. Worthington 25,621
Rule or measuring stick, J. Davis 25,609
Tobacco case, S. H. Arrell 25,610
Valve pot, C. C. Worthington 25,622
Washing machine casing, C. Dietz 25,623

TRADE MARKS.

Beer, lager G. Ebret 28,360
Bicycles, C. S. Faulkner 28,373
Bicycles, tools and appliances for mending, F. C. Durant 28,372
Bottle washing machine, Hoyt Brothers & Company 28,375
Buttons and buttons manufactured from native shells, pearl, Boepple Button Company 28,355
Cement, imported, C. Zunz 28,363, 28,364
Copper, bronze, aluminum and other metals, and phonographs, typesetters and typewriters, Maguire & Baucus 28,368
Cutlery, table, bread, and butcher knives, table, American Cutlery Company 28,369
Fertilizing compositions or compounds, R. W. L. Rasin 28,367
Guano, phosphate, manure and similar compounds, R. W. L. Rasin 28,366
Guano, phosphates, superphosphates and similar compounds, P. P. Dunan 28,365
Jewelry and silverware, Stone Sterling Silver Company 28,350
Lamps, bicycle, Adams & Westlake Company 28,371
Lamps, incandescent electric, C. G. Perkins 28,370
Medicated shoe pads, Antiswetsol Company 28,354
Metal polish, firm of S. Herz 28,351
Neckwear, J. Prenowitz 28,353
Oils, illuminating, Freedom Oil Works Company 28,361, 28,362
Ointments, J. Hughes 28,356
Remedy for diseases of the blood, liver, stomach and kidneys, H. Van Allen 28,357
Tobacco and cigars, Pendas & Alvarez 28,358, 28,359
Umbrellas and parasols, Hirsh & Brother 28,352
Washing machines other than wringers, hand power, Boss Washing Machine Company 28,374
Watchcases, Bates & Bacon 28,349

LABELS.

"Chicago Yeast Powder," Chapman & Smith Company 6,546

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

© 1896 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

WOOD or METAL WORKERS
without steam power can save *time* and *money* by using our
Foot and Hand Power Machinery
SEND FOR CATALOGUES—
A—Wood-working Machinery.
B—Lathes, etc.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

AMERICAN PATENTS.—AN INTEResting and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers

POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE. SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

Smart Men

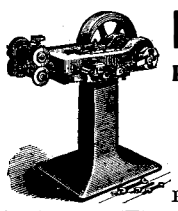
Were not always smart. They had to study and read and learn. They had to get all the ideas they could from other people. The smartest engineers, mechanics and machinists to-day read ***Lord's Power and Machinery Magazine.*** It is an educator. It gives its readers the most valuable information and facts every month for less than 10 cents. You ought to subscribe. $1 a year. Send 10 cents for a sample to

GUILD & LORD
618 Atlantic Ave., BOSTON, Mass.

Copyright 1896.—Bates-Whitman Company, N. Y.

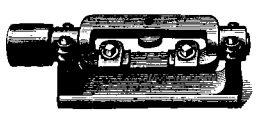
THE CURTIS
Water Pressure Regulator
For Hotels and Public Buildings, Water Motors, Hydraulic Elevators, etc.
Will maintain the pressure desired, with perfect uniformity, regardless of any and all fluctuations in the outside pressure.
☞ *Send for Circular S. F.*
D'ESTE & SEELEY CO.
29-33 Haverhill St., Boston.

WORK SHOPS
of Wood and Metal Workers, without steam power, equipped with
BARNES' FOOT POWER MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. *Catalog Free.*
W. F. & JOHN BARNES CO.
1999 RUBY ST., ROCKFORD, ILL.



Rivet Machinery
RAPID ACTION
MODERN DESIGN
HIGH-GRADE WORK
BUILT BY
THE E. J. MANVILLE MACH. CO.
P. O. Box 54, WATERBURY, CONN.

WIRE STRAIGHTENER
This straightener is of an improved pattern, and will straighten wire from No. 3 to No. 20.
Price $12.00
☞ *Send stamp for catalogue of machinists' tools.*

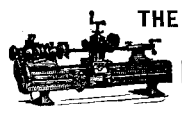


CHANDLER & FARQUHAR,
38 FEDERAL STREET, BOSTON, MASS.

Repair Bicycles for a Living.—Your boy's hobby may be mechanics; if so, get him the proper tools.

Here is a bicycle repair outfit complete. Illus. catalogue of tools for stamp. Fred. Frasse Co., 21 Warren St., N.Y.

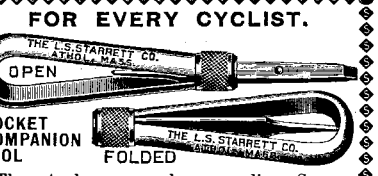
FINEST AND FASTEST
THE RIVETT LATHE



Faneuil Watch Tool Co.
Boston, Mass., U.S.A.
With the new attachment, the Rivett Automatic Chuck Closer, from 100% to 300% more work can be done.
NEW TOOLS . . . NEW CATALOGUE, 1896

PERFORATED METAL OF EVERY DESCRIPTION AND FOR ALL USES
THE HARRINGTON & KING PERFORATING CO.
CHICAGO, ILL. U.S.A. AND 284 PEARL ST. NEW YORK

FOR EVERY CYCLIST.

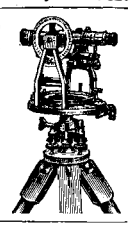


Three tools you are always needing: Screw-driver, Awl, Wrench. All in one light, compact combination, finely finished, nickeled. Weighs only 2 oz. Length closed 3 in. If your hardware dealer hasn't it we will send it on receipt of **45 cents.** Stamps taken.
THE L. S. STARRETT CO., Box 33, **Athol, Mass.**

TRANSITS AND LEVELING INSTRUMENTS.
NICKEL PLATED ELECTRIC LEVELS

Sizes, 2 and 3 inches. Prices, 25 and 30 cents.
For Book on the Level. **C. F. RICHARDSON & SON,** P. O. Box 977, **Athol, Mass., U. S. A.**

"Queen" Builder's Transit
$100
IMPROVED TRANSITS AND LEVELS
Graduated entirely on our large dividing engines. Special award at World's Fair. All kinds of Engineering, Surveying and Drafting Instruments and Materials. 220 p. Illustrated Catalogue mailed free only if this ad. is mentioned
QUEEN & CO., Inc.,
1011 Chestnut St., Philadelphia



Spinning and Twister Ring Blanks
Sent, postage paid, to any address on receipt of 12 cents in stamps.

The Billings & Spencer Co., Drawer 3, **Hartford, Conn.**

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for inventors.

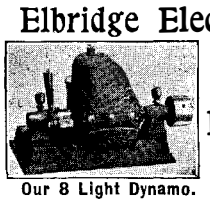
In this line of business they have had *nearly Fifty years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

MUNN & CO., SOLICITORS OF PATENTS,
361 BROADWAY, NEW YORK.
BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, WASHINGTON, D. C.

Elbridge Electrical Mfg. Co.



Our 8 Light Dynamo.

ELBRIDGE, N. Y.
MANUFACTURERS OF
. . . High Grade
Dynamos and Motors
for Light and Power.

Measuring Tapes.

Chesterman's, Excelsior, Lufkin's, Eddy's, Roe's, etc., and supplies of all kinds for Architects, Engineers and Draughtsmen.
Frost & Adams Co.
Established in 1848.
39 Cornhill,
BOSTON, MASS.

LITTLE GIANT SCREW PLATES

Wire sizes for Jewelers, Dentists, Tool Makers, and Amateurs use. Machinists' sets with Taper, Plug, and Bottoming taps for pipe and bicycle work. Also blacksmiths and carriage makers use. ☞ *Send for fully illustrated catalogue.*
WELLS BROS. & CO., P. O. Box B, Greenfield, Mass.

THE ORNAMENTAL IRON INDUSTRY.—Description of the method of manufacturing wrought iron into ornamental and artistic forms. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1020.** Price 10 cents. To be had at this office and from all newsdealers.

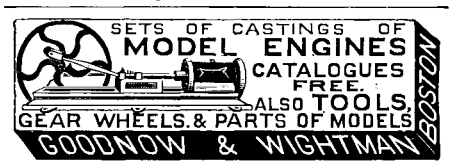
Trucks of Every Description.

The Handy Truck
Price F. O. B. $2.00
Self-Lubricating $2.25
A Book on Trucks Free.
Boston & Lockport Block Co.
143 Commercial St., Boston, Mass.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

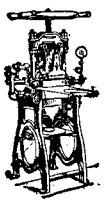
Giant Screw Drivers, 6 in., 45c.—nickel ferrules, rosewood handles. Cabinet Screw Drivers, 6 in., 35c.—rosewood handles, nickel ferrules. Nail Sets, 10c. Swedish Sloyd Knives, 30c.
Mailed postpaid. ☞ *Catalogue free.*
TUCK MANUFACTURING CO.
AMES STREET, BROCKTON, MASS.

"My Well and what came out of it."
A story by the novelist Frank R. Stockton.
"Your Well and what will come out of it."
By the
Pohlé Air Lift Pump
Bulletins to tell you will be sent on application.
The Ingersoll-Sergeant Drill Co.
Havemeyer Building, 26 Cortlandt Street, New York.



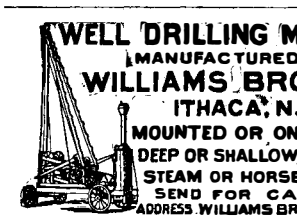
ACETYLENE GAS AND CARBIDE OF Calcium.—All about the new illuminant, its qualities, chemistry, pressure of liquefaction, its probable future, experiments performed with it. A most valuable series of articles, giving in complete form the particulars of this subject. Apparatus for making the gas. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **998, 1004, 1007, 1012, 1014, 1015, 1016, 1022, 1035** and **1038.** The most recent apparatus of simple and more elaborate type described and illustrated in special acetylene Supplement No. **1057.** Price 10 cents each. To be had at this office and from all newsdealers.

DORMAN'S VULCANIZERS
are used all over the world.



Exclusive Manufacturers of Steam Machines for Rubber Stamps. We also make Dry Heat Vulcanizers. Complete outfits from $10 to $1,000. All Stamp and Stencil Tools and Supplies. Brass and Steel Dies for all purposes. Seals, Engraving and Die Sinking of all kinds. Established 1860.
☞ *Send for Catalogues.*
THE J. F. W. DORMAN CO.
121 E. Fayette St., Baltimore, Md., U. S. A.

WELL DRILLING MACHINERY
MANUFACTURED BY
WILLIAMS BROTHERS,
ITHACA, N.Y.



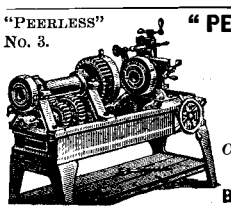
MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER
SEND FOR CATALOGUE
ADDRESS WILLIAMS BROS. ITHACA, N.Y.

AUTOMATIC-OPENING
SCREW CUTTING CHUCK

The only chuck made that works automatically without outside connections. In use by the most prominent manufacturers in the U. S. and other countries.
Pat. Dec. 1889. **KARL MISCHKE,**
162 W. 27th Street, New York,
Manuf'er of hardware specialties and tools of all kinds.

TURBINE WATER WHEELS.
SEND FOR PAMPHLET.
JAMES LEFFEL & CO.,
Springfield, Ohio, U. S. A.

"PEERLESS" No. 3.

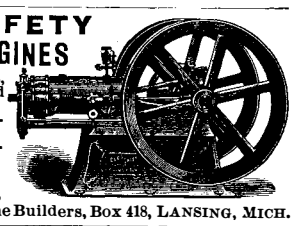


"PEERLESS" DUPLEX PIPE THREADING MACHINES
Combination Bench and Pipe Vises.
Continuous Feed Ratchet Drill
Bignall & Keeler Mfg. Co.
Box 373, Edwardsville, Ill.

Electricity

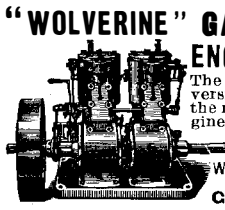
To Electrical ....Workers,
Mechanics; Mechanical and Architectural Drawing; Plumbing; Architecture; Mining; Civil Engineering in all Branches; Steam Engineering (Stat'y., Loco. and Marine).
References. Free Apparatus. Send for Circular, Stating Subject you wish to Study.
The International Correspondence Schools B 942, Scranton, Pa.

OLDS SAFETY VAPOR ENGINES



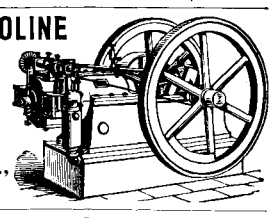
FREE from cams, gears, rockarms and complications.
Greatest simplicity, efficiency, and durability. *Get catalogue by sending 2 2-cent stamps.*
P. F. OLDS & SON,
The Gasoline Engine Builders, Box 418, LANSING, MICH.

"WOLVERINE" GAS AND GASOLINE ENGINES, STATIONARY and MARINE.



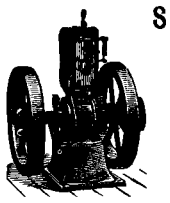
The "Wolverine" is the only reversible Marine Gas Engine on the market. It is the lightest engine for its power. Requires no licensed engineer. Absolutely safe. Manufact'd by
WOLVERINE MOTOR WORKS,
12 Huron Street,
GRAND RAPIDS, MICH.

GAS and GASOLINE ENGINES.



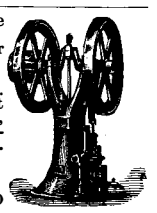
Using Natural Gas, Coal Gas, Producer Gas, and Gasoline direct from the tank. 1 to 40 H. P., *actual.*
The Springfield Gas Engine Co.,
21 W. Washington St.
Springfield, O.

SINTZ GAS ENGINE CO.

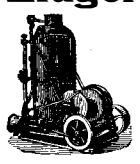


GRAND RAPIDS, MICH., U. S. A.
Manufacturers of the **Sintz Stationary and Marine Gas and Gasoline Engines.** Especially adapted for Boats and Electric Lighting. Runs with manufactured or natural gas—Boats and launches. Prices within the reach of all. ☞ *Send for Catalogue.*
Mention this paper.

This beats Wind, Steam, or Horse Power. We offer the
WEBSTER 2½ actual horse power
GAS ENGINE
for **$150,** less 10% discount for cash. Built on interchangeable plan. Built of best material. Made in lots of 100, therefore we can make the price. Boxed for shipment, weight 800 pounds. Made for Gas or Gasoline.
☞ *Write for Special Catalogue.*
WEBSTER MFG. CO.
1074 West 15th Street, CHICAGO



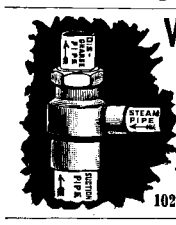
Lidgerwood Hoisting Engines.



300 STYLES AND SIZES.
OVER 12,000 IN USE.
☞ *Send for Catalogue.*
LIDGERWOOD MFG. CO.
96 Liberty Street, New York.

PREISTMAN SAFETY OIL ENGINE
"*A thoroughly successful commercial Engine using a Safe Oil.*"—Franklin Institute

No Extra Insurance, No Steam, No Gas, No Gasoline. Reliable, Safe, Economical, and Convenient. Chosen by Nine Governments. Used for nearly every purpose.
PREISTMAN & CO., Incorp'd,
530 Bourse Bldg., PHILADELPHIA, PA.



VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

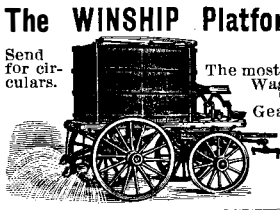
Experimental & Model Work
E. V. BAILLARD, 106 Liberty Street, N. Y.

DO YOUR OWN PRINTING
$5. PRESS for cards, circulars, &c Press for printing a small paper, $40.

Save money! Make money printing for others! Type-setting easy. Printed rules. Write for catalogue, presses, type, cards, etc., to factory.
KELSEY & CO.
Meriden, Conn.

GATES ROCK AND ORE BREAKERS
LEAD ALL OTHERS IN ECONOMY, DURABILITY, CAPACITY
ESTIMATES furnished for COMPLETE CRUSHING PLANTS
We manufacture **MINING MACHINERY** of every description.
Gates Iron Works, Dept. C, 650 Elston Av. Chicago, Ill

The WINSHIP Platform Sprinkling Wagon.
Send for circulars.



The most complete Sprinkling Wagon ever built.
The Accommodation Gear Street Sprinkler, to fit any lumber wagon, is sold with long or upright tank, and with or without wagon. The Winship Mfg. Co., Racine, Wis

ROCK DRILLS
AIR COMPRESSORS &
GENERAL MACHINERY FOR
MINING, TUNNELING, QUARRY & RAILROAD WORK.
RAND DRILL CO 100 BROADWAY, NEW YORK

© 1896 SCIENTIFIC AMERICAN, INC.

BOOKS ON ELECTRICITY AND MAGNETISM

JUST READY.

A Catalogue of Books on Electricity, Magnetism, Electrical Engineering, Electric Lighting, Electric Railways, Telephone, Electro-Deposition of Metals, Electrotyping, Electro-Metallurgy, and Cognate Subjects. 32 pages. Sent free to any one in any part of the world who will furnish his address.

HENRY CAREY BAIRD & CO.
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut St., Philadelphia, Pa., U. S. A.

WATER MOTORS

GAS ENGINES & VENTILATING FANS

The best Motor in the world for driving all kinds of light machinery, noiseless, neat, compact; invaluable for blowing church organs, running printing presses, coffee mills, ventilating fans, ice cream freezers, meat choppers, etc. In use the world over, and recommended by water companies everywhere. Address for circular,
Backus Water Motor Co., Newark, N. J., U. S. A.

BUY TELEPHONES

That Are Good—Not "Cheap Things."
The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are **both good.**
Western Telephone Construction Co.
250 So. Clinton Street, CHICAGO
Largest Manufacturers of Telephones in the United States

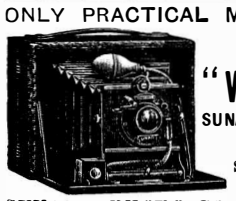
TELEPHONES

for Long or Short Distance Use. Also Interior or Warehouse Telephones. Sent on trial to responsible parties. Sold thousands during the last two years, every one a success.
☞ *Send for Circular and Testimonials.*
Julius Andrae & Sons Co.
MILWAUKEE, WIS.

FOR INVENTORS AND PROMOTERS.

WANTED: Some easy selling electrical or mechanical specialty by well equipped Machine Works. Would manufacture under royalty, or buy privilege outright.
Address "SPECIALTY," care this paper.

ONLY PRACTICAL MAGAZINE CAMERA.



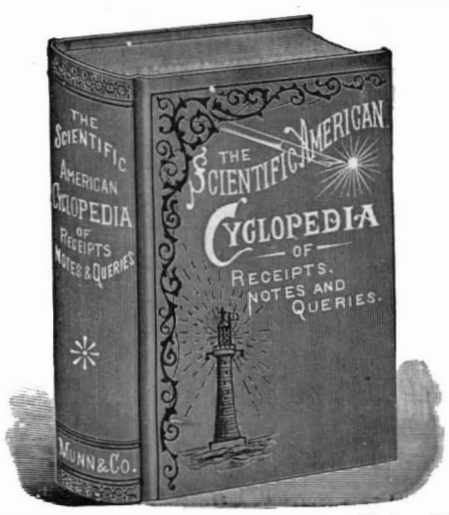
SUNART'S "VENI, VIDI, VICI,"
SUNART MAGAZINE, SUNART FOLDINGS.
Send for Illustrated Catalogue—2 cent stamp.
SUNART PHOTO CO., ROCHESTER, N. Y.

A. W. FABER
Manufactory Established 1761.
LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.
78 Reade Street, - - - New York, N. Y.
Manufactory Established 1761.

LOOSE BOTTOMS PERFECTION CAKE TINS

CAKE
Easily removed without breaking. Perfection tins require no greasing. Round, square and oblong. 2 round layer tins by mail 35 cents. *Catal. Free.* Agents wanted.
RICHARDSON MFG. CO., 9th St., Bath, N. Y.

A Valuable Book


THE SCIENTIFIC AMERICAN CYCLOPEDIA OF RECEIPTS NOTES & QUERIES
THE SCIENTIFIC AMERICAN CYCLOPEDIA OF RECEIPTS, NOTES AND QUERIES.
MUNN & Co.

12,500 Receipts. 708 Pages. Price $5.
Bound in Sheep, **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions. ☞ *Send for Descriptive Circular.*

MUNN & CO., Publishers,
SCIENTIFIC AMERICAN OFFICE,
361 Broadway, New York.

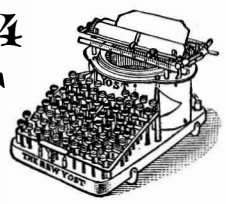
The No. 2 Hammond

Possesses
ALIGNMENT—Perfect and permanent.
IMPRESSION—Invariably uniform.
TOUCH—Soft, light and elastic.
SPEED—206 words a minute.
DURABILITY—The fewest parts, the best made
VARIETY—12 languages, 37 styles of type, paper or cards of any width or size on one machine.
PORTABILITY—Weighs only nineteen pounds complete, with traveling case.

THE HAMMOND TYPEWRITER CO., - 401 East 62d Street, - NEW YORK

ACETYLENE APPARATUS.—ACETYLENE number of the SCIENTIFIC AMERICAN SUPPLEMENT, describing, with full illustrations, the most recent, simple, or home made and commercial apparatus for generating acetylene on the large and small scale. The gas as made for and used by the microscopist and student; its use in the magic lantern. The new French table lamp making its own acetylene. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1057.** Price 10 cents. To be had at office.

The No. 4 YOST WRITING MACHINE



The distinctive features of the Yost Machine, permanent alignment, direct inking, beautiful work, strength, simplicity, and durability are shown in perfection in the No. 4 Model, which has been proved by two years' use to be the best on the market. ☞ *Catalogue free.*

Yost Writing Machine Co.
61 Chambers St., NEW YORK CITY. 50 Holborn Viaduct, LONDON, ENG.

THE DURANT COUNTING MACHINES

Received the Highest Award at the World's Fair.
☞ Send for catalogue to
W. N. DURANT,
233 22d St., Milwaukee, Wis.

DIXON'S American Graphite PENCILS
Write the Smoothest and Last the Longest.
Mention SCIENTIFIC AMERICAN and send 16 cents for samples worth double the money.
JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

The Typewriter EXCHANGE,
1½ Barclay St., New York.
156 Adams St., Chicago.
38 Court Sq., Boston.
818 Wyandotte Street, Kansas City, Mo.
We will save you from 10 to 50 per cent. on Typewriters of all makes. ☞ *Send for Catalogue.*

BATTERY FAN OUTFIT

Most practicable complete outfit of 1 No. 5 motor with 10 inch fan, 2 cells No. 6 motor battery, which will run motor 160 hours on one charge of solution. Complete $18. We make the dollar Franklin Motor, also small motors and apparatus for every purpose.
☞ *Send Stamp for Circulars.*
Franklin Elect. & Mfg. Co., Miamisburg, O.

Portable X Ray Apparatus

Our No. 2 Outfit for Physicians, Professors, Photographers, and Students. Complete in handsome case, including coil, condenser, 2 sets tubes, battery, etc. Price, $15, net, delivered in U. S. Guaranteed highest class apparatus.
F. J. PEARSON MFG. CO.
Main & Locust Sts., St. Louis, Mo.

CARBORUNDUM
HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER, CRYSTAL, WHEEL, SLAB & HONE FORM.
CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

HE IS DEAD

To his own interest, who deals in Arms and Ammunition or who shoots a Rifle Pistol, or Shot Gun and has not a copy of IDEAL HAND BOOK, No. 7. A. 100 pages of solid information. Just out. (Mention Scientific American.) BE ALIVE and send for one FREE to all countries. Send stamps for postage.
IDEAL MFG. CO., Drawer A, **New Haven, Ct., U. S. A.**

METAL and WOOD WORKERS' TOOLS
FOOT POWER SCROLL SAWS, MORTISERS, LATHES, FORMERS, CIRCULAR SAWS and **MACHINERY.**
We carry in Stock all the **LEADING** Foot Power Machinery AND MAKE **VERY LOW PRICES!**
Send 4 cents for large Illus. Catalog.
THE WILKINSON CO., 83 Randolph St., Chicago.

THE SCIENCE OF MECHANICS.
DESCRIPTIVE CIRCULAR FREE. OPEN COURT PUB. CO. CHICAGO

ICE MACHINES. Corliss Engines. Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

MAGIC LANTERNS WANTED AND FOR SALE OR EXCHANGE! HARBACH & CO. 809 Filbert St. Phila. Pa.

SHORTHAND by Mail. Situations furnished competent pupils. **First lesson free.** Write **W. G. CHAFFEE,** Box A, **Oswego, N. Y.**

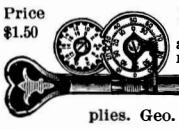
STEEL TYPEWRITER TYPE
TYPE WHEELS, MODELS & EXPERIMENTAL WORK, SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST N.Y.

DEAFNESS CURED! THE EAR VAPORATOR Cures
Deafness on Strictly Scientific principle. Satisfaction guaranteed. Circulars free. **EAR VAPORATOR CO., 195 LaSalle St., Chicago.**

WOODEN TANKS.
For Railroads, Mills and Manufactories. Builders of Steel Towers and Tanks. La. Red Cypress Wood Tanks a specialty.
W. E. CALDWELL CO.,
217 E. Main Street, Louisville, Ky.

INVENTORS
OF SPORTING SPECIALTIES WILL FIND IT OF ADVANTAGE TO CORRESPOND WITH AND SUBMIT THEIR ARTICLES TO H. P. O. BOX 2308 NEW YORK.

Price $1.50



DOUBLE SPEED INDICATOR
applied to shaft revolving either right or left. Accurate and reliable. Has split cap for pointed centers. Tools, metals, manufacturers supplies. Geo. W. Church. 109 Fulton St., N. Y.

FREE ARMENIA! FREE CUBA! FREE EDUCATION!

ARMENIAN MASSACRES A history of the oldest Christian nation, the annals of its endless persecutions by the Turks, and a graphic account of the recent butcheries and heroic efforts to help this long-suffering race. Thrilling and enchanting, though blood-curdling and horrifying. Brilliantly written, and endorsed by Hon. W. E. Gladstone, Francis E. Clark, D.D., Cyrus Hamlin, DD, Miss Frances E. Willard, and a host of other Christian workers. Profusely illustrated from views taken on the spot. An entrancing work on a subject of supreme importance at this time. Prices: Cloth, $1.50; Half Russia, $2.00, postpaid.

THE WAR IN CUBA A graphic history of Spanish tyranny and the fierce struggle for Cuban freedom. Written by celebrated Cuban officers and patriots in the midst of this desperate conflict, and full of wonderful pictures of battles, hand-to-hand combats, and portraits of the chief actors in the bloody drama now being enacted at our very doors. Tells how the **Bermuda** landed her cargoes, and of the part Americans are taking in the strife. Sells everywhere, and at sight. Prices: Cloth, $1.50: half Russia, $2.00.

AGENTS WANTED in every town. Now is the time to do business. Everybody is talking about Armenia and Cuba. Complete outfit for either book sent free on receipt of 10c. to pay postage; outfit for both for 20c. Don't delay a minute, get "in the swim" and make money.

College professors, high-school principals, teachers and graduates, and educated and energetic people generally, are requested to correspond with us in reference to assisting in the distribution of our

Encyclopædic Dictionary

after June 1, 1896. This great work, comprising four immense volumes of 5359 pages, richly illustrated, is at once a perfect, up-to-date dictionary and a practical, comprehensive encyclopedia of general knowledge. More than 100,000 sets have been sold during the past eighteen months, and it is to-day the most popular and salable reference work in print. It is sold at low prices on easy monthly payments. Our new methods will make easy and profitable work after the date named above. This is an unusual chance for high class and really competent solicitors. In making application, please state fully previous experience, qualifications, and references. Full particulars on request.

Address, SYNDICATE PUBLISHING CO., 234 S. Eighth Street, Philadelphia, Pa.

They have a tone that's all their own. . . . .

THE NEW DEPARTURE BELLS are the standard of excellence the world over. Made in 16 different styles and prices. Send postal for booklet to **THE NEW DEPARTURE BELL CO., 210 North Main Street, Bristol, Conn., U. S. A.**

WANTED First-class Machinist to operate Automatic Wire Bending Machines. Only those who thoroughly understand such machines need apply. Address PITTSBURG MIRROR & MFG. CO., Limited, Putnam Street, E. E., PITTSBURG, PA.

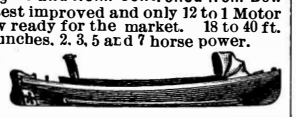
THOMAS KANE & COMPANY,
64 & 66 Wabash Avenue, Chicago.

DESIGNERS AND BUILDERS OF
High Grade Row and Sailboats, Hunting Boats and Canoes, Steam and Vapor Launches
☞ *Inclose 10 cents for Catalogue A.*

SMALL GASOLINE LAUNCHES

17 ft. by 31 in. ¾ h. p. motor. For 1 or 2 persons. Speed, 8 to 9 miles per hour. Pleasure Boats, Canoes, Collapsible Boats, all sizes and prices. ☞ *Send for catalogue "S. A."* J. H. RUSHTON, CANTON, N. Y

ALCO VAPOR LAUNCH
Engine and Helm Controlled from Bow
Latest improved and only 12 to 1 Motor now ready for the market. 18 to 40 ft. Launches. 2, 3, 5 and 7 horse power.



No licensed Engineer or Pilot required. *Speed and Safety guaranteed. No Dangerous Naphtha or Gasoline used.*
Marine Vapor Engine Co., Jersey City, N. J.

Quarter of Century Old. **CHEAP, STRONG, WATERPROOF.**
FAY'S MANILLA ROOFING.
Not affected by gases. No RUST nor RATTLE. *Outlasts Tin or Iron.* A durable substitute for plaster on walls. Waterproof sheathing of same material, best and cheapest in the market. ☞ Write for samples, etc.
THE FAY MANILLA ROOFING CO.,
517-519 Point Street, Camden, N. J.

CONTRACTS WANTED.
To manufacture Hardware Specialties, Pat'd Novelties and Sheet Metal Stamping. Lang Mfg. Co., Racine, Wis.

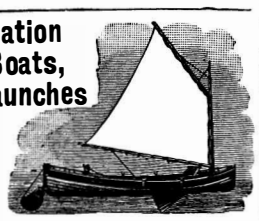
WANTED—A MILLWRIGHT. A good general mechanic to attend to repairs at a factory near New York. State wages expected, age, and nature of previous experience. Steady employment to a good man. Address P. O. BOX 2324, NEW YORK.

PORTABLE SINGLE RAIL SURFACE Railway.—Details of construction and description of rolling stock of a new system of portable railway which may be laid upon ground that has received no special preparation for its reception. With 19 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1014.** Price 10 cents. To be had at this office and from all newsdealers.

MONITOR
MARINE GAS ENGINES AND LAUNCHES

MONITOR VAPOR ENGINE & POWER COMPANY
GRAND RAPIDS, MICHIGAN.
EASTERN OFFICE, LUDLOW STATION, YONKERS, N.Y. CATALOGUE FREE.

Canoes, Combination Row and Sail Boats, Cruisers and Launches
OF HIGH GRADE.
☞ Send stamp for Illustrated Catalogue "S.A."
HOUSATONIC SKIFF AND CANOE CO., DERBY, CONN.



Before Buying a New Harness, send 2c. stamp for illus. catalogue giving full description of Custom Hand-made Oak Leather Harness. Sold direct to consumers at wholesale prices. We pay the fght. KING HARNESS CO., Mfrs., 9 Church St., Owego, N.Y. ☞ *Send for catalogue S. A.*

ROSE POLYTECHNIC INSTITUTE
Terre Haute, Ind. A School of Engineering, Mechanical, Electrical, Civil Engineering, Chemical Courses. Well endowed. Extensive Shops and Foundry. Modernly equipped Laboratories in all departments. Expenses low. Address, **C. L. MEES,** President

STEEL STAMPS. NAME STAMPS FOR MARKING TOOLS AND ETC. FIGURE AND ALPHABET SETS AT PRICES BEYOND COMPETITION. BEST STEEL ALL WARRANTED. 10¢ PER LETTER. SEND FOR CIRCULAR. **SCHWAAB STAMP & SEAL Co** MILWAUKEE WIS.

FOR SALE A patent safety attachment for ladies' pocket books, purses and like articles. A most unique and perfect invention. Address, **Frank G. Bruce,** P. O. Box 214, Mount Vernon, N. Y

The Hanson Hydraulic Ram
100% more effective with a given supply and head of water, than any other ram made. ☞ *Booklet free.*
F. B. HANSON, 176 Center St., New York.

DYNAMOS Complete drawings and instructions for any size or type. Send 50 cents for 10 light drawings and sample designs.
A. L. MERRILL, OXFORD, O.

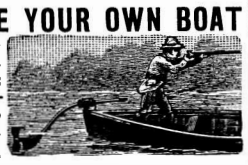
BRASS BAND
Instruments, Drums, Uniforms, Equipments for Bands and Drum Corps. Lowest prices ever quoted. Fine Catalog, 400 Illustrations, *mailed free;* it gives Band Music & Instructions for Amateur Bands.
LYON & HEALY, 33-35 Adams St., Chicago.

CROOKES TUBES AND ROENTGEN'S Photography.—The new photography as performed by the use of Crookes tubes as a source of excitation. All about Crookes tubes. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **181, 189, 238, 243, 244, 792, 795, 905, 980, 1050, 1054, 1055, 1056, 1057,** also SCIENTIFIC AMERICAN, Nos. **7, 8, 10** and **14,** vol. 74. These profusely illustrated SUPPLEMENTS contain a most exhaustive series of articles on Crookes tubes and the experiments performed with them. Among them will be found Prof. Crookes' early lectures, detailing very fully the experiments which so excited the world, and which are now again exciting attention in connection with Roentgen's photography. Price 10 cents each. To be had at this office and from all newsdealers.

Family Ice Machine Ice, etc., in a few minutes, $10 and up. Filters, $1.25 and up. Cookers, $1. Seltzateurs to prepare one's self soda water, $4.50 and up. L. DERMIGNY, 126 W. 25th St., N. Y.

THE ONLY PORTABLE ELECTRIC PROPELLER. USE YOUR OWN BOAT

NO SPECIAL BOAT NEEDED. Shift to any other at will. No danger, no fires, explosions, or engineering. A child can manage it. Simple "PRESS THE BUTTON" plan. Only propeller movable in every direction; therefore, only one usable in shallowest or deep water. Call and see it. *Send stamp for illustrated circular.*
FRANK S. ALLEN, 136 Liberty Street, New York, U. S. A.



UNION CARBON BATTERY
A perfect battery for electric bells, telephones, etc. Price complete 40c. each. $4 per doz. Illustrated circular free. **C. M. TURNQUIST, 216 South Clark Street, Chicago, Ill.**

© 1896 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Palmer Tires

give the rider confidence

THEY are the only tires you are sure of getting home on if punctured. Air will not escape for hours. *Palmer Tires* are the easiest riding, quickest repaired and fastest Tires. They mark the high-grade wheel. They are expensive. Send for catalogue. PALMER PNEUMATIC TIRE CO., CHICAGO.

HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its origin up to the present time. The first crank-driven bicycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The pneumatic tire. A hand and foot cycle. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1012. Price 10 cents. To be had at this office and from all newsdealers.

Typewriter Patent

This company owns Letters Patent No. 558,428, issued April 14, 1896, covering broadly all machines in which the cylinder turns up to expose the line of print, or in which a duplex or cross ribbon feed is used. The patent also covers many other features of modern typewriter construction. Infringers will be vigorously prosecuted.

Wyckoff, Seamans & Benedict.
327 Broadway, New York.

The American Bell Telephone Company,

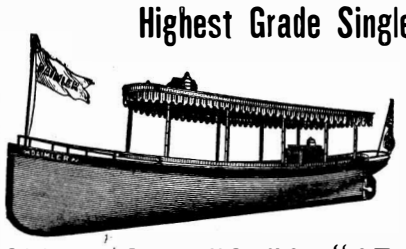
125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

DAIMLER MOTOR COMPANY,

BUILDERS OF

Highest Grade Single and Twin Screw Launches.



Safest, cleanest and speediest power boat built. No smoke or smokestack, no boiler, no electricity. No steam or naphtha under pressure. Run on one pint of gasoline per horse power per hour, and are under way in less than one minute. No licensed engineer or pilot.

Also Stationary Motors.

☞ Send for Illustrated Catalogue and Price List.

OFFICE AND WORKS, "STEINWAY," LONG ISLAND CITY, N. Y.

MANUFACTURE OF BICYCLES.—A very comprehensive article giving the details of construction of every part of these vehicles. With 15 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 908. Price 10 cents. To be had at this office and from all newsdealers.

Columbias

AT ONCE.

The Columbia you want is ready for you. No delay, if you choose regular equipment. We have been preparing for months to meet the present great demand.

$100 TO ALL ALIKE
Tandems, $150

Men's Columbias
Women's Columbias
Tandems

THE STOCK IS COMPLETE

Hartford Bicycles

$65, $50, $45

Such quality at such prices is unheard of. But Hartfords are leaders in both price and goodness. Regular models ready for immediate delivery.

POPE MFG. CO. Hartford, Conn.

Branch Stores and Agencies in almost every city and town. If Columbias are not properly represented in your vicinity, let us know.

THE Duguid CYCLE SADDLE

for Ladies' use. Broad and comfortable, and guaranteed to hold its shape. Most sensible and serviceable Saddle in the market. Twenty years' experience in working leather enables us to make good this claim.

ALL STYLES GENTLEMEN'S SADDLES also. Ask for the Duguid. If your dealer will not supply you, we will send, prepaid, on receipt of price: Ladies', $4.00; Gentlemen's, $3.50. *Furnished with clip for T or L seat post.*

THE DUGUID SADDLERY CO., Syracuse, N. Y.

The Dodge Bicycle.

A STRICTLY HIGH GRADE WHEEL.
SUPERIOR MECHANISM
FIRST CLASS WORKMANSHIP
THE DODGE CYCLE CO.
MANUFACTURERS.
SO. WEST ST. SYRACUSE N.Y.

MODEL "A" WEIGHT 22 Lbs.

The Name "HUNTER" . . .

never was put on anything that wasn't first-class. That name has stood for simple, plain, unvarnished integrity, and hence it is put on the . . .

. . HUNTER CYCLES

☞ *Send for Catalogue.*

HUNTER ARMS CO., FULTON, N. Y.

At ¼ Price

Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs. Pianos Safes, Tools Scales of all varieties and 1000 other articles Lists free. CHICAGO SCALE Co., Chicago. Ill.

NEWAYGO AUTOMATIC CIRCUIT BREAKERS

Guaranteed to operate perfectly or no pay. Made for alternating or direct current.
. . . . . Any Voltage. Catalogue Free . . . . . .
AUTOMATIC CIRCUIT BREAKER COMPANY, NEWAYGO, MICHIGAN, U. S. A.

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. FOR FINE TOOLS IN EVERY SHOP. C. H. BESLY & CO. CHICAGO, ILL. U.S.A.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

WHITMAN

"WHITMAN MEANS EXCELLENCE."

"WHITMAN MEANS EXCELLENCE."

Best mechanics employed. Micrometer measurements. Hand screw machines. Natural gas brazing. Uniform tempering perfect bearings, exceptional durability } HAND MADE

The WHITMAN - - $100
The PATRIOT - - - $85

"Conscience" { *Every* part of *every* wheel tested. Each wheel tested as a whole. WHITMAN EXCELLENCE. WHITMAN GUARANTEE.

WHITMAN SADDLE CO., 118 Chambers St., N. Y.
Catalog on application. If our wheels are not on sale in your town, write for agency.

If you want the best CHUCKS, buy Westcott's

Little Giant Double Grip Drill Chucks, Little Giant Drill Chucks Improved, Oneida Drill Chucks, Cutting-off Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by Westcott Chuck Co., Oneida, N. Y., U. S. A. *Ask for catalogue in English, French, Spanish or German.* FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

MR. BOOKKEEPER,

do you know what the Comptometer is? It costs you nothing to find out. It will help you out on that trial balance. It insures accuracy, is twice as rapid as the best accountant and relieves all nervous and mental strain.

Write for Pamphlet.

FELT & TARRANT MFG CO.
52-56 ILLINOIS ST., CHICAGO.

Howard Chainless Bicycle.

The first man in any town who buys one will be allowed an agent's discount and offered an agency, whereby he gets commissions that will pay for his wheel, or at least reduce the cost. Address HOWARD, 771 Summer Av., Newark, N.J.

FOR SALE Piercing and forming punches and dies jigs, lathe tools, milling cutters, gages and all special machinery for making The Hall Typewriter. Address, Nat. Typewriter Co., Boston

If Inventors and Manufacturers

Having new articles of merit to place on the market will forward samples or description of their goods, they will receive careful attention and consideration by The Elastic Tip Co., 46 Market St., San Francisco, Cal.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
Wm JESSOP & SONS Ltd 91 JOHN ST. NEW YORK

NO DIRT. NO SMOKE. NO NOISE. NO LICENSE. ABSOLUTELY SAFE.

PENNSYLVANIA IRON WORKS COMPANY,

BUILDERS OF THE

"GLOBE" GAS . . . AND GASOLINE ENGINES

for Stationary and Marine Service.

Launch with 9-I. H. P. "Globe" Engine, property of F. F. Milne, Island Heights, N. J.

☞ *Catalogues and Prices on application.*

Address, 50th Street and Lancaster Avenue, PHILADELPHIA, U. S. A.

The $5.00 POCKET KODAK

EASTMAN KODAK CO.,
Sample photo and booklet for two 2-cent stamps. ROCHESTER, N. Y.

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.

Hartford SINGLE-TUBE... Tires

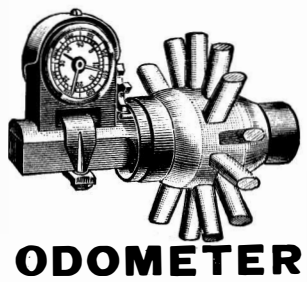
THE ORIGINAL SINGLE-TUBES.

are made of proper rubber, proper fabric, properly put together—proper tires in every way. Make bicycling pleasure absolute.

Hartford Tires are furnished with most bicycles of highest grade. Can be had on any.

THE HARTFORD RUBBER WORKS CO.
HARTFORD, CONN.
New York. Philadelphia. Chicago.

If you own a good HORSE AND CARRIAGE you will be interested in our



BELL ODOMETER

It will tell you honestly how many miles you drive, and announce each mile by stroke of a bell. Keeps a record for 1600 miles and then repeats. Speed horses may be timed very accurately. Fully warranted. Price, by mail, $5.00. In ordering send height of rear wheel.

☞ *Write for Descriptive Circular.*

Davis, Stebbens & Co., 33 Sudbury St., Boston, Mass.

Gas and Gasoline Stationary Engines

GASOLINE TRACTION ENGINES
COMBINED ENGINES & PUMPS
GASOLINE PORTABLE ENGINES

USED Any Place By Any One For Any Purpose

CHARTER GAS ENGINE CO., P. O. Box 148, Sterling, Ill.

PRINTING INKS

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1896 SCIENTIFIC AMERICAN, INC.